FORESTRY ABSTRACTS

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ABSTRACT SECTION

0. FORESTS, FORESTRY, AND THE UTILIZATION OF FOREST PRODUCTS: GENERAL

For general *regional* accounts see section 90

Translations

See Nos. 4265, 4648, 4766, 4982–3, 5099, 5111, 5120–1, 5143, 5173, 5190–2, 5195, 5235–6, 5249, 5304, 5310.

0 (021). Handbooks. Textbooks

4029. **Forestry handbook for British Columbia.** Forestry Club, University of British Columbia, Vancouver. 2nd ed. (rev.) 1959. pp. xii + 800. Many refs.

[Cf. *F.A.* 15 No. 2178.] The present edition is greatly expanded.

0 (038). Dictionaries

See also No. 5087.

4030. Buchanan, J. A. **First N.Z. glossary of forest and timber terms completed.** *N.Z. Timb. J.* 5 (8), 1959 (52–3). 11 refs.

Notes on the selection of terms, mainly the scientific and commercial names of timbers, with those on silviculture, botany, soils, meteorology, sawing, engineering, fungi and insects, of chief interest to the New Zealand timber trade, made from a 5-year compilation, and published in 32 parts under the title 'Know your timber terms', Vols. 2–5, 1956–1959, of this journal.

4031. Ambros, J. Názvosloví anglicko-české pro lesnictví a dřevařství. **[English-Czech terminology for forestry and timber technology.]** Dřevoprojekt, Prague. 1958. pp. 523. 27 refs. I.F.B.

Includes the scientific names of many plants and animals.

4032. Naučný slovník lesnický. I. **[Forestry encyclopaedia. Part I.]** Československá Akademie Zemědělských Věd, Prague. 1959. pp. 701. [Cz.] Price *Kčs*. 120. I.F.B.

Part I covers A to I. The scope of the encyclopaedia includes: forest geology, pedology, meteorology and climatology; forest botany, dendrology and phytocoenology; silviculture; forest protection and forest zoology; hunting; agricultural and forest improvement; forest management, dendrometry, economics and forest policy; forest exploitation; forest mechanization; forest engineering and torrent control; minor forest products; wood anatomy, properties, defects, and sawing.

4033. Gozdarsko-lesna terminologija. **[Forestry and wood terminology.]** *Les, Ljubljana* 8 (6/7–10), 1956 (102–4; 123–4; 139–40; 155–6); 9 (1–9/10), 1957 (15–6; 31—2; 47–8; 63–4; 85–8; 103–4; 119–20; 143–4). [Sloven.]

An alphabetical list of terms with definitions, in Slovenian. Tree species, with their scientific names, are included.

0 (048.1). Bibliographical Lists

See also Nos. 4053, 4215, 4237, 4303–5, 4622, 4705, 4720, 5186, 5289.

4034. Seppälä, A. [Compiler] **Bibliographia universalis silviculturae. Fennia 1943–44.** Helsingin Yliopiston Metsäkirjasto, Helsinki. 1959. pp. 107. [Fi.E.]

A bibliography of Finnish forest literature. References are arranged by the Oxford system of decimal classification for forestry. Titles have been translated into English, if not given on the title page in English, French or German. There is an author index. [Cf. *F.A.* 20 No. 3.]

4035. **References on forestry and forest products in Israel—1958.** *Leafl. Dep. For. Israel* No. 8, 1959. pp. 3. 43 refs. [E.]

The references, arranged alphabetically by author, give the title in English, the publication, and indicate the language of the article and whether it has a summary. [Cf. *F.A.* 19 No. 3731.]

4036. Eakin, M. L. [Compiler]. **Society of American Foresters check list of forestry items in a working library.** *J. For.* 56 (8), 1958 (586–91).

Lists, under main subject heads, books, bulletins, scientific journals, trade journals, and magazines considered desirable in a [N. American?] forestry library. The books are each given a desirability rating.

4037. Jackman, M., Berry, M. W., and McMahon, R. O. [Compilers]. **Economics of forestry: a bibliography for the United States and Canada, 1953–54.** *Library List, U.S. Department of Agriculture, Washington* No. 52 (*Suppl.* No. 2), 1959. pp. 45.

[Cf. *F.A.* 17 No. 3555.] There are 1187 entries.

0 (05). Periodicals. Yearbooks. Directories. Almanacs, Calendars, Diaries

4038. ***Mitteilungen der Hessischen Landesforstverwaltung.*** J. D. Sauerländer's Verlag, Frankfurt am Main.

A new series to be issued at irregular intervals by the Hesse Forest Department for the publication of experience and findings of interest to the practical forester in field and office. Citation in *F.A.*: *Mitt. Hess. Landesforstverw.*

4039. ***Folia forestalia polonica* (*Leśnictwo*).** Wydział Nauk Rolniczych i Leśnych, Polska Akademia Nauk, Warsaw.

No. 1, 1958, contains 135 pages. It is intended to publish original research work, scientific reviews, experimental work, etc. in forestry. The series will appear irregularly. Citation in *F.A.*: *Folia for. polon.* (*Leśn.*).

4040. ***Revista forestal venezolana.*** Universidad de los Andes, Merida, Venezuela.

After a gap from July/Dec. (Vol. 3, No. 12) 1956, the *Boletín de la Facultad de Ciencias Forestales, Universidad de los Andes*, has reappeared under the title *Revista Forestal Venezolana* starting with Jan./March (Vol. 1, No. 1) 1958. Citation in *F.A.*: *Rev. for. venez.*

0 (084.3/4). Maps. Atlases

See also Nos. 4350, 5316.

4041. Carte des sols et de la végétation du Congo Belge et du Ruanda-Urundi. 10. Kwango. A.—sols, B.—végétation. **[Map of the soils and vegetation of the Belgian Congo and Ruanda-Urundi. 10. Kwango. A.—Soils, B.—Vegetation.]** Institut National pour l'Étude Agronomique du Congo Belge (I.N.É.A.C.), Brussels. 1958. pp. 65 + 2 maps. 50 refs. [F.]

Consists of an explanatory booklet (*R. Devred, C. Sys* and *J. M. Berce*) and the soil and vegetation maps, scale 1:1,000,000.

4042. Carte des sols et de la végétation du Congo Belge et du Ruanda-Urundi. 12. Région de Bengamisa (A et C). **[Map of the soils and vegetation of the Belgian Congo and Ruanda-Urundi. 12. The Bengamisa region (A and C).]** Institut National pour l'Étude Agronomique du Congo Belge (I.N.É.A.C.), Brussels. 1958. pp. 47 + 1 sheet of maps. 8 refs. [F.]

Consists of an explanatory booklet on the soil map, with an appendix giving descriptions and analyses of the soil series (*A. van Wambeke*) and 2 maps (scale 1:100,000) viz. (A) soils, (C) soil utilization (*G. Fontaine* and *R. Verhaeghe*).

4043. Carte des sols et de la végétation du Congo Belge et du Ruanda-Urundi. 13. Région du Lac Albert. A.—sols. C.—utilisation des sols. **[Map of the soils and vegetation of the Belgian Congo and Ruanda-Urundi. 13. The Lake Albert region. A.—Soils. C.—Land use.]** Institut National pour l'Étude Agronomique du Congo Belge (I.N.É.A.C.), Brussels. 1959. pp. 50 + 2 maps. 8 refs. [F.]

Consists of an explanatory booklet (*A. van Wambeke*) and the soil map and land-use map, scale 1:100,000 (*T. de Moffarts* and *A. van Wambeke*).

0 - - 011. Terminology. Nomenclature

See Nos. 4030–3, 4198, 5087.

0 - - 015. Mathematical and Statistical Methods

See also No. 4415.

4044. SCHMIDT, W. Einführung in statistische Verfahren. **[Introduction to statistical methods.]** *Forstarchiv* 29 (9;11), 1958 (200–7; 242–9); 30 (3), 1959 (45–56). 22 refs. [G.]

Gives examples of their application to forestry, and in the final sections offers advice on the planning and setting up of experiments and surveys.

1. FACTORS OF THE ENVIRONMENT. BIOLOGY

11. Site Factors: Climate, Situation, Soil, Hydrology (Water Conservation, Soil Conservation and Erosion)

111. The Atmosphere. Meteorology. Climate and Microclimate

111.2. Radiation and Temperature

See also No. 4096.

4045. CZARNOWSKI, M., and SLOMKA, J. **Some remarks on the percolation of light through the forest canopy.** *Ecology* 40 (2), 1959 (312–5). 8 refs.

Studies were made in a 25-year *Pinus sylvestris* stand of uniform growth and with closed canopy, using Lange-Type S60 photo-electric selenium cells in boxes measuring 1·15 × 1·15 × 0·50 m. Six concentric rings were cut out in the horizontal lid of the box, their sizes being devised so that, as they were removed one by one, the cell was exposed to successively larger inverted cones of light in which the angle between the incident ray and the zenith was 0°-10°, 10°–20°, 20°–30°, 30°–40°, 40°–50° and 50°–60° Percolation of light from the zenith was measured by a cell at the bottom of a perpendicular cylinder. Measurements were made in the open as well as under canopy, when the sky was clear and when it was covered with cloud. A formula was evolved for the distribution of the brightness transferred through the forest canopy:

$$\frac{I}{I_0} = w \,.\, k^{\frac{1}{\cos a}},$$

where I and I_0 are the light intensity measured respectively in the definite canopy zones and in the open, a is the angle of incidence of the light, and $w.k$ is the zenith percolation of a forest canopy. In the stand studied, the ratio of I to I_0 was 15–21% depending on the cloudiness of the sky. The amount of radiation scattered by the tree crowns is also discussed.

4046. **Amount of light on forest floor as related to stand density conditions.** *Rep. Cent. St. For. Exp. Sta. 1958*, [1959] (37–8).

Light conditions were measured in upland forests of Southern Illinois using an Integrating Light

Meter and also a light exposure meter. An opening of 100 ft. diam. (1½ times the height of surrounding trees) received ca. ½ as much light as a station in the open. An opening of 30–35 ft. diam. (½ the height of surrounding trees) received ¼ of the full light, twice as much as under a closed Oak/Hickory canopy, and 8 times as much as under a closed Beech canopy. Light measurements between 9 a.m. and 3 p.m. showed that the mean light that comes through the crown canopy is roughly proportional to the basal area of the stand. Light fluctuations on the forest floor during the day are described.

4047. EVANS, G. C., and COOMBE, D. E. **Hemispherical and woodland canopy photography and the light climate.** *J. Ecol.* 47 (1), 1959 (103–13 + 4 plates).

The Hill camera, which photographs a complete hemisphere with a single exposure, provides a rapid method of recording the structure of woodland canopies as seen from a point. By superimposing the track of the sun on the photographs it can be seen whether woodland light measurements have been made under representive conditions and whether direct insolation at a particular time is possible. Canopy photographs taken in temperate and tropical forests demonstrate some of the sources of variation in the fraction of diffuse sky light reaching the forest floor (the 'day light factor') and help to elucidate its significance. *From authors' summary.*

4048. WHITMORE, T. C., and WONG, Y. K. **Patterns of sunfleck and shade in tropical rain forest.** *Malay. Forester* 22 (1), 1959 (50–62). 6 refs.

The importance of light as a factor in the microclimate of forest and stages of the succession after felling, is indicated. This is followed by a brief discussion of the complexities of the light composition in forests, and a consideration of some of the difficulties of making readings of biological significance. An apparatus designed by Dr. G. C. Evans, for the survey of the light composition over considerable areas in forests, is described [cf. *F.A.* 18 No. 1224], and observations made using this apparatus, in lowland tropical rain forest in Singapore are presented. These are divided into those made under cloudy, sunny and hazy conditions. From the cloudy readings the daylight factor is evaluated and is compared with values obtained in other forests. The sunny readings are analysed in detail and an estimate of the light energy received by an undergrowth plant from different sources during a whole year is obtained. Roughly half the total energy is shown to come from sunflecks. Of the shade light, about one-eighth comes directly through holes in the canopy and the rest is reflected from various objects or transmitted through the foliage. As a first approximation, hazy conditions are divided between the cloudy and sunny observations. A comparison of the light pattern with that found in a southern Nigerian rain forest shows a considerable similarity in the amount and distribution of the energy received by an undergrowth plant. The method is shown to be sensitive enough to detect small differences within the site sampled, and an extension is suggested for the surveying of disturbed forest. *Authors' summary.*

111.5. Wind

See Nos. 4721–2.

111.7. Humidity, Evaporation. Clouds etc. Precipitation

See Nos. 4083, 4099–4102, 4727.

111.8. Climatology. Climate and Microclimate

See also Nos. 4297, 4341, 4529, 4955, 4994.

4049. KHAN, M. A. W. **Climate of the dry zone [of India].** *Indian For.* 85 (3), 1959 (139–81). 36 refs.

114. Soil. Soil Science

See also Nos. 4586, 4732.

4050. BEATON, J. D. **The influence of burning on the soil in the timber range area of Lac le Jeune, British Columbia. I. Physical properties. II. Chemical properties.** *Canad. J. Soil Sci.* 39 (1), 1959 (1–11). 19 refs. O.R.E.

(I) Three-inch soil cores taken from 7 areas burned in 1943, 1945 or 1951, where in most cases Lodgepole Pine was the dominant species, were compared with cores from unburned areas within the burned-over ones. Decreases in total porosity, non-capillary porosity, and infiltration rate were noted, and an increase in capillary porosity and soil temperature at a depth of 3 in.

(II) Samples taken from the surface organic layer (O horizon) and the underlying leached mineral layer (A_2) on the same 7 burned areas showed that burning resulted in an increase in pH, total P content, and CO_2-soluble Ca of the O horizon of most of the soils studied. The organic matter, total N, and H_2CO_3-soluble P and Mg of the O horizon, were reduced. No significant changes were noted in the A_2 horizon.

114.1. Soil Physics

See also Nos. 4050, 4077, 4087, 4099, 4103, 4106, 4251–5, 4455, 4513, 4520, 4529, 4590.

4051. LULL, H. W. **Soil compaction on forest and range lands.** *Misc. Publ. U.S. Dep. Agric.* No. 768, 1959. pp. 33. 94 refs.

Describes the process of compaction (*a*) by logging, (*b*) by trampling of men and animals, analyses the site factors that affect compaction (soil texture and structure, soil density, soil m.c., organic-matter content, frost), discusses the effects of compaction on infiltration and percolation and on vegetation, and suggests measures to reduce it.

4052. STOECKELER, J. H. **Trampling by livestock drastically reduces infiltration rate of soil in Oak and Pine woods in Southwestern Wisconsin.** *Tech. Note Lake St. For. Exp. Sta.* No. 556, 1959. pp. 2.

As a result of grazing, the rate of infiltration was reduced from 7·46 to 0·05 in./hour in Oak and from 11·02 to 1·23 in./hour in Scots Pine stands.

4053. MARSHALL, T. J. **Relations between water and soil.** *Tech. Commun. Bur. Soil Sci., Harpenden* No. 50, 1959. pp. vii + 90. 13 pp. of refs. Price 20*s*.

A review written from the angle of the agricultural use of soil (but including some other work on fluids in porous media), covering water storage and retention, permeability of soils, distribution of water in soil, movement of water vapour and of salts, availability of water for plants, measurements of water content and suction *in situ*, water and tillage properties, etc.

4054. MARSTON, R. B. **Use of nuclear soil moisture meter in studies of evapo-transpiration on mountain soils.** *Proc. Soc. Amer. For.* 1958 (1959), (39–41). 3 refs.

In tests of soil moisture under Aspen and mountain brush, the instrument, whose action is based on the slowing-down effect exerted by hydrogen on fast neutrons, gave widely fluctuating readings on replication and poor correlation with gravimetric determinations. As it requires the installation of access pipes in the soil, work was slow. There is also a not inconsiderable radiation hazard.

4055. MERRIAM, R. A. **Nuclear probe compared with other soil moisture measurement methods.** *For. Res. Note Calif. For. Range Exp. Sta.* No. 146, 1959. pp. 5.

This method, consisting of measuring the number of neutrons modified by collision with H atoms (existing in the soil mainly in the form of water) was compared with gravimetric sampling and Colman fibreglass units. A Nuclear-Chicago Corporation model P19 was used to detect modified neutrons, and a Nuclear-Chicago Model 2800 portable scale recorded and timed the count. Advantages of this technique are that sampling is limited only by the depth to which access tubes are installed, and that successive samples can be taken from the same point and additional samples from intermediate points if desired. The method was both fast and accurate; the time required for field sampling was intermediate between the other two, but as the field data are directly convertible to inches of water in the profile, computation time was greatly reduced.

4056. NEUWIRTH, G. Der Wasserhaushalt von Baumbeständen unter dem Aspekt von Bodenfeuchte und Saugkraftbestimmungen. **[Water economy of tree stands in relation to soil moisture and soil moisture tension.]** *Arch. Forstw.* 7 (6/7), 1958 (449–58). 11 refs. [G.g.russ.e.]

[Cf. *F.A.* 17 No. 3603.] Discusses the weekly variation through one growing season of the soil moisture tension (gypsum-block method) and soil moisture (galvanometer) in 4 similar natural soils and in 4 lignite-tip soils under various stands, mainly young Poplar [cf. *F.A.* 20 No. 4141] but including Pine and mixtures and also nursery beds. Water use, though largely dependent on leaf volume, is not simply correlated with it, as stand structure, microclimate, and soil are also concerned. Specific variation in water use in the course of stand development (e.g. Pine and Poplar) is also shown. The heaviest stands do not necessarily use most water; particularly on poor soils, soil development under a growing stand can maintain a good water balance with the latter. The stand most endangered by drought was an Aspen stand with unfavourable conditions for developing humus.

4057. SANDS, K., and RUTTER, A. J. **The relation of leaf water deficit to soil moisture tension in *Pinus sylvestris* L. II. Variation in the relation caused by developmental and environmental factors.** *New Phytol.* 57 (3), 1958 (387–99). 6 refs. O.R.S.

[Cf. *F.A.* 20 No. 240.] In experiments in which pots with 3- to 5-year plants were allowed to dry from field capacity to soil tensions of $\geqslant 5$ atm., multiple regressions showed that most of the variation in leaf water deficit could be accounted for by changes in soil moisture tension and transpiration rate. The leaf water deficit at sunrise was again found to be the best index of the soil moisture conditions experienced by the plant. The effect of various factors on the relation between soil moisture tension and leaf water deficit was experimentally examined and it was found that the relation was affected by the age of needles used for the determination, the time of year, N nutrition and soil moisture conditions before the experiment. The way in which these factors may operate is discussed. Despite this variability, broad conclusions may be drawn from measurements on leaf water deficit in 1-year leaves at sunrise. Thus in soils near field capacity, leaf water deficits rarely exceed 8%. Deficits of 12–14% indicate soil moisture tensions in the 1–5 atm. range, and when the deficits exceed 17%, the soil moisture has probably been reduced to the permanent wilting %. *From authors' summary.*

4058. SUDNICYN, I. I. Vlijanie funkcional'nyh svojstv počvennoj vlagi na intensivnost' pogloščenija ee drevesnymi porodami. **[The influence of the functional properties of soil moisture on the rate of water uptake by trees.]** *Počvoved.* 1958 (11), (65–72). 17 refs. [Russ.russ.e.] A.P.B.

Measurements were made of soil moisture and soil moisture tension under young Oak plantations on ordinary chernozem (medium clay-loam) at Derkul' (Voroshilovgrad province) to determine their effect on the uptake of moisture by roots. Findings, which are analysed statistically, indicate that the availability of soil moisture to roots is directly related to their suction power, the soil moisture tension and the moisture conductivity of the soil. A gradual decrease in soil moisture is accompanied by rapid decrease in soil moisture tension and moisture conductivity. These relationships are defined in formulae. With falling soil moisture, the suction power of Oak roots increases, at first slowly, then more rapidly, and a marked gradient of moisture tension develops near the absorbing root surface. Increase of this gradient enables the flow of water to the root to continue at a high rate in spite of the reduced moisture conductivity of the soil but, on reaching a certain physiological limit (lying, for the drought-resistant forms of Oak, in the range 30–40 atm.), the suction power ceases to rise, the moisture tension gradient falls rapidly and the flow of water to the root stops.

4059. GULIDOVA, I. V., and AFANAS′EVA, E. A. Vlijanie vlažnosti počvy na intensivnost′ transpiracii drevesnyh i kustarnikovyh porod. **[The influence of soil moisture on the transpiration rate of trees and shrubs.]** *Počvoved.* 1957 (8), (46–53). 10 refs. [Russ.] A.P.B.

In the southern chernozem zone (Balashov province) measurements were made during the growing seasons of 1952 and 1953 of transpiration (Ivanov's rapid-weighing method) and soil moisture in 3 types of stand: (*a*) dense 25-year-old Oak/Norway Maple with an underwood of *Acer tataricum*, (*b*) 45-year *Fraxinus pennsylvanica* with a dense underwood of *A. tataricum*, and (*c*) 47-year *Fraxinus excelsior* or *F. pennsylvanica* with a relatively open canopy and a suppressed underwood of Elm. The growing season in this region can be naturally divided into two periods (1) the period after the winter, when soil moisture in the main rooting zone is readily available, and (2) the summer, when moisture is not easily available. Average daily transpiration is tabulated by species and stand type for (1) and (2) over the two years; a further table shows the average amount transpired daily by each species during the two periods. It is concluded that in this region soil moisture is the major factor determining transpiration rate. A relationship between rate of transpiration and air temperature or light is observed only when soil moisture exceeds a value corresponding to capillary disruption. If the moisture content in the upper horizons of the rooting zone falls to $<70\%$ of the minimum moisture capacity, the transpiration rate drops abruptly; it remains more or less constant when soil moisture has decreased to levels between capillary disruption and the wilting point. During (1) plants transpire freely; during (2) transpiration is reduced. Of the species studied, Oak had the lowest, and *A. tataricum* and *Lonicera tatarica* the highest transpiration rates. Trees growing in a hollow in all cases transpired more than those on the watershed.

4060. WILL, G. M. **Soil-moisture and soil-temperature studies under Radiata Pine, Whakarewarewa Forest.** *Repr.* from *N.Z. J. agric. Res.* 2 (1), 1959 (184–93). 8 refs.

The changes in soil moisture and temperature under 7- and 39-year *Pinus radiata* stands were measured to a depth of 9 ft. 9 in. from Oct. 1954 to Oct. 1955, and correlated with the rainfall and mean daily temperatures. The soil was Rotomahana shallow sandy loam over Taupo ash. It was found that fibreglass soil-moisture resistance units gave more rapid responses than gypsum ones. Even in a summer drier than average, the soil did not dry out appreciably at depths >1 ft., the drying out of the surface soil to wilting point having no apparent effect on the trees. Further experiments will be made on the more widespread pumice soils.

4061. WEBER, N. A. **Isothermal conditions in tropical soil.** *Ecology* 40 (1), 1959 (153–4). 2 refs.

At depths of 10, 20, and 30 cm., temperatures on a forest site on an island in the Panama Canal Zone varied only between 25·7 and 26·2° C. in June, March and December. On a neighbouring clearing they ranged from 28·6 to 30·8°. *From author's summary.*

4062. ZÖTTL, H. Die Abhängigkeit der Bodentemperatur vom Wasserhaushalt wechselfeuchter Standorte. **[The dependence of soil temperature on the water regime on sites showing marked seasonal changes in soil moisture content.]** *Forstwiss. Cbl.* 77 (11/12), 1958 (329–35). 22 refs. [G.g.]

Experiments showed that in the spring, in soils on forest sites (not carrying trees), similar except for the water regime, temperatures were as much as 2° C. lower on the wetter, periodically saturated sites.

114.2. Soil Chemistry

See also Nos. 4050, 4065–8, 4074, 4077–8, 4080–5, 4087, 4120, 4122, 4260–3, 4278, 4306, 4496, 4514, 4520, 4587–8.

4063. BERNIER, B. **Characterization of polysaccharides isolated from forest soils.** *Biochem. J.* 70 (4), 1958 (590–8). 43 refs. O.R.S.

The polysaccharides isolated from all the 5 soils examined, comprising both mor (upper mineral horizon) and mull (mull layer) soils, were complex heteropolysaccharides. All contained glucuronic acid, galactose, glucose, mannose, xylose and rhamnose, all but the high-molecular-weight preparation from one mull soil contained arabinose, and all mull-soil polysaccharides contained fucose.

4064. AMBROŽ, Z. O kvantitativním, a kvalitativním složení humusu v některých půdních typech, převažně lesních—II. **[Qualitative and quantitative composition of humus in some soil types, mainly forest soils. II.]** *Sborn. čsl. Akad. zeměd.* (*Lesn.*) 3 (1), 1957 (21–32). 22 refs. [Cz.cz.russ.e.g.*russ. e.g.*]

[Cf. *F.A.* 17 No. 2385; 19 No. 3759.] Humic acids from (*a*) chernozems contained ca. 58% C, and those from (*b*) podzols and peat 51–54%. Some 4–5% N was found in the humic acids of (*a*), and 2–3% in those of (*b*), about half the N being very strongly fixed in the acids. Humic acids from (*a*) contained more carboxyl groups than those from (*b*), while hydroxyl groups were roughly even. The complicated structure of the humic acids of chernozems and rendzinas is shown by the strong coagulation capacity and greater absorption of light rays. *From author's summary.*

114.3. Soil Formation. The Soil Profile and its Development. Litter, Humus etc.

See also Nos. 4074, 4077, 4093–5, 4306, 4496.

4065. ROŽNOVA, T. A., and SČASTNAJA, L. S. Izučenie vzaimosvjazi rastitel′nosti i počv v uslovijah Karel′skogo perišejka. **[The interrelations of vegetation and soil in the Karelian isthmus.]** *Počvoved.* 1959 (1), (19–29). 21 refs. [Russ.russ.] A.P.B.

In a study of soil formation in the N. of the isthmus, soils and plant cover were sampled on 6 plots situated on a low hill, of which the following 4, from ridge line to valley bottom, are described:

(*a*) *Cladonia alpestris* on a primitive soil; (*b*) Spruce with moss (*Pleurozium schreberi*) and *Vaccinium myrtillus* on a peaty, strongly podzolic soil; (*c*) Spruce with sphagnum on a strongly podzolic soil with gleying in the lower horizons; (*d*) Birch/Pine with a deciduous understorey and herbaceous ground cover, on a gleyed sod-podzolic soil. Results are shown in graphs and tables. The first stages of soil formation, exemplified by the humus-rich fine earth of (*a*), are characterized by accumulation of clayey products and, compared with the parent rock, of P, S, Ca and Mg. In (*b*), Ca, K and Mn are intensively leached from the decomposing moss litter. The soil-and-ground water in spring has a high content of Ca, which is carried down-slope to (*d*). The decomposing litter and humus of (*b*) and (*c*) show accumulation of SiO_2, Al and Fe, but SiO_2 is leached out in greater quantities than the sesquioxides. The accumulation of Fe in these horizons increases progressively with increase of soil moisture and general leachability of the soil, maximum accumulation of Fe being found in the decomposing sphagnum of (*c*). Under normal conditions of soil moisture, e.g. in (*d*), Fe accumulates in the mineral horizons, where it fixes humous substances.

4066. Evdokimova, T. I. Razvitie počvoobrazovatel′nogo processa na metamorfičeskih porodah Karelii. **[The development of the soil-forming process on metamorphic rocks in Karelia.]** *Počvoved.* 1957 (9), (60–9). 15 refs. [Russ.e.] A.P.B.

Analyses were made of the N and ash contents of the vegetation (Pine, Aspen, Birch, and several species of lichen), soil and parent rock material, in Pine forests to the N.W. of Lake Onega. The soil was shallow humus, reaching depths of ca. 15–20 cm. In the first stages of soil formation the sod-forming process predominates, but colonization by conifers intensifies the podzolization. The roots of the tree species intensify the breakdown of minerals and show high Si and Al contents. The highest contents of individual elements, both in plant leaves and in the rock, were of S, P, K and Mn; those of Ca and Mg were less important. Lichens significantly influence the N content of the soil, as they form a habitat for a specific group of oligonitrophile micro-organisms. Conditions for forest growth are favourable on these soils, as they are rich in N, P, K and Ca.

4067. Pelíšek, J. Chemismus tvorby lesních půd na některých krystalických břidlicích západní Moravy. **[The chemistry of forest soil formation on some crystalline schists in W. Moravia.]** *Sborn. čsl. Akad. zeměd.* (*Lesn.*) 5 (4), 1958 (357–78). [Cz.cz.russ.g.]

In investigations on podzol formation and the dynamics of soil-forming processes, studies were made on medium podzols—(1) on gneiss poor in nutrients, and (2) on amphibolitic schists rich in nutrients. Both soils carried Spruce with some Pine. The stratigraphy of the main soil components was found to be basically the same qualitatively on (1) and (2), but not quantitatively. Total SiO_2 content increased from the parent rock towards the surface, with a small peak also in the B horizon. Total Al_2O_3, CaO, and K_2O contents decreased from parent rock to soil surface. The P_2O_5 content, probably affected by biological accumulation in the upper layers, reached its maximum in the B horizon. The soil fraction soluble in hot 20% HCl was lowest in the upper layers, and highest in the B horizons; its main components were for both (1) and (2), $SiO_2 + Al_2O_3 + Fe_2O_3$, which usually make up 90–92%, the rest being CaO, MgO, P_2O_5, etc.

4068. Livens, J., and Vanstallen, R. Recherches sur le rôle de la litière dans la désaturation en bases des sols forestiers sur limon loessique. **[The role of litter in the reduction of base saturation of forest soils on loess loam.]** *Agricultura, Louvain* (*Sér.* 2) 4 (2), 1956 (113–32). 16 refs. [F.f.du.e.] L.S.

Aqueous extracts (*a*), and 'percolates' (*b*) made by allowing water to drain through a layer of litter placed on a layer of soil representing one of the 5 main horizons, were prepared weekly from mixed litter—mainly of Beech (1) or mainly of Oak (2)—taken from *Querceto-Carpinetum* on leached grey-brown podzolic soil in process of development towards brown podzolic soil. In (*a*) the Ca, K and Mg contents, and the pH, were consistently lower for (1) than for (2); (*b*) showed marked differences as between different soil horizons, but little difference between (1) and (2), the differences tending to level out just before parent rock (limestone) was reached. While (1) tended to impoverish the surface layers of soil and (2) to restore bases to them, the total loss of Ca in the profile differed little and the vegetation is considered to play a secondary role in the general genetic development of the soil.

4069. Járó, Z. Alommennyiségek a magyar erdök egyes típusaiban. **[Litter production in Hungarian forests.]** *Erdészettud. Közl., Sopron* 1958 (1), (151–62). 5 refs. [Hu.hu.russ.f.g.*russ. f.g.*]

On the basis of a single collection of the current year's litter layer on 106 sample plots, the author presents data on air-dry weight/ha. in relation to species (broadleaved), age, site class, soil and forest type etc. Litter production increased with age, at all events up to the period of culminating increment. It was greater on good than on poor sites, and greater in mixed than in pure stands. Robinia, Hornbeam and Field Maple produced least. For Beech, Hornbeam and White Poplar, litter production equalled the m.a.i. in terms of air-dry weight/ha. For Robinia, it was about half. *From author's summary.*

4070. Carmean, W. H. **Litter weight not reduced following clearcutting of poor-site Oak stands [in S.E. Ohio].** *J. For.* 57 (3), 1959 (208–9). 2 refs.

On plots being converted to Pine, clear felling the Oak before planting Pine did not cause any significant reduction in the weight of the humus layers, after nearly 4 years. The slash, coppice shoots, herbaceous plants and young trees provided cover, and there was none of the expected loss of litter, exposure of mineral soil, and erosion.

4071. HAYES, A. J. **The decomposition of forest litter.** *Coedwigwr* 3 (3), 1958/1959 (105–10). 43 refs.

A review of literature.

4072. YAWNEY, H. W. **A soil-depth probe for shallow forest soils.** *J. For.* 57 (6), 1959 (435). 2 refs.

A tapering, pointed steel shaft, 3·8 ft. long, graduated in feet and tenths, is hammered into the soil till bedrock is reached, and the soil depth read off. A handle is used to facilitate extraction from the soil.

114.4. Soil Classification. Soil Types

See also Nos. 4064–8, 4306, 4346.

4073. WRIGHT, T. W. **Forest soils in Scotland.** *Emp. For. Rev.* 38 (1), 1959 (45–53). 5 refs.

Examines the properties of soils either under forest or available for afforestation, mainly podzols and their associates, and the blanket peats of the north and west. Methods of improving them by drainage, ploughing or manuring, and modifications that may be brought about by tree growth, are described.

4074. DIETRICH, H. Untersuchungen zur Morphologie und Genese grundwasserbeeinflusster Sandböden im Gebiet des nordostdeutschen Diluviums. **[Morphology and genesis of groundwater-influenced sands of the N.E. German diluvium.]** *Arch. Forstw.* 7 (8), 1958 (576–640). 85 refs. [G.g.russ.e.]

A detailed investigation, with profile descriptions and diagrams, of the following soils and their ground-water (mean water-table level in cm. in brackets): (*a*) podzol with low gley horizon (>150) under 100-year Pine; (*b*) gley-podzol (100–150) under 70-year Oak and 80-year Pine; (*c*) podzol-gley (80–100) under 120-year Beech; (*d-f*) true gleys (65–80)—(*d*) mull gley and (*e*) moder gley, both under mixed Oak/Hornbeam, (*f*) raw-humus gley; (*g*) fen mull gley (<65) under uneven-aged Oak/Birch/Alder; (*h*) fibrous peat-gley (not discovered in the area) and (*i*) moor gley under 70-year Alder. The systematic position of these soils is discussed with American and Russian equivalents. Points from the summary are: a characteristic rust zone is found in soils with an artificially lowered water table (drainage and river training); the mean water table is marked by the upper limit of the grey reduction gley horizon; when the seasonally changing water table is high, the ground-water has a low mineral content, and *vice versa*; for alkalinity determination, titration with 0·1 *N* HCl and methyl orange will include Ca bound as bicarbonate. The influence of acidity and of the water-table level on vegetation and soil formation is outlined.

4075. PELÍŠEK, J. K charakteristice půd lužních lesů východního Slovenska. **[The characteristics of the *Auewald* soils in E. Slovakia.]** *Lesn. Čas.* 5 (1), 1959 (19–33). [Cz.cz.russ.g.]

Divides the soils into: (*a*) gley soils and humus gley soils, (*b*) true and humus gley-like soils, (*c*) alluvial soils, and describes the fluctuations in ground-water level, the nutrient status, bacteria, texture, etc. of each. The trees carried are Oak, Ash, Elm, Poplar, Willow, etc., Poplar doing particularly well on (*c*).

4076. BASINSKI, J. J. **The Russian approach to soil classification and its recent development.** *J. Soil Sci.* 10 (1), 1959 (14–26). 32 refs.

Includes a description of the work of the U.S.S.R. permanent commission (1956) for (*a*) nomenclature and diagnosis of taxonomic units and (*b*) approach to classification. For (*a*), type, subtype, family, and form are defined and Rode's method for diagnosis summarized. For (*b*), Rozov's genetic grouping (76 soil types, Arctic to tropics) is tabulated and schematized.

4077. DURASOV, A. M. Solodi i serye lesnye osolodelye počvy lesostepi severnogo Kazahstana. **[Solods and grey forest solodized soils of the forest steppe of N. Kazakhstan.]** *Počvoved.* 1959 (1), (52–8). 26 refs. [Russ.russ.e.] A.P.B.

Compares the morphology and physical and chemical properties of solod and grey forest solodized soils. From the author's and other data it is concluded that under the Birch or Pine woods of N. Kazakhstan solodization occurs, and podzolization is prevented, as a result of the aridity of the climate, the occurrence of saline Tertiary clays close to the surface and the sparseness of the woodland, the process being more marked under Birch. Grey forest or sod-podzolic soils analogous to those of the forest-steppe in the Russian plain and the S. Siberian foothills, do not occur in this region.

4078. KAWADA, H. **[A study on chemical properties and humus forms of forest soil.]** *For. Soils Japan For. Exp. Sta. Meguro, Tokyo* No. 10, 1959. pp. 108. 106 refs. [Jap.e.]

[Cf. *F.A.* 18 No. 3639.] Soil types were classified according to Ohmasa [see *F.A.* 14 No. 26], into subdivisions of brown, podzolic and black forest soils. Experimental methods used are described and results for the 3 groups of soil from Fujio, Iwase and Nibuna are tabulated and discussed separately. Further subdivisions of Ohmasa's classification, based on differences in topography, chemical properties and humus forms are presented.

4079. **Soil-vegetation surveys in California.** Department of Natural Resources, Sacramento, Calif. 1958. pp. 27 + [16]. 31 refs.

[Cf. *F.A.* 15 No. 3936.] Gives information on their aims, methods etc., with a supplement containing a map key to the area and lists of the maps already available for purchase. Two types of map (scale 2 in. to the mile) are produced: (1) showing soil series, distribution of important woody species, land class and timber site-quality in areas suitable for growing conifers; and (2) showing broad vegetation types, density of woody vegetation and age- and density-class of commercial forests.

114.5. Soil Fertility. Soil Toxicity. Soil Depletion and Exhaustion

See also Nos. 4089, 4120–1, 4256–8, 4260–3, 4386, 4520, 4587–8, 4998–9.

4080. **Site fertility related to soil nitrogen, exchangeable cation balance.** *Calif. For. & For.*

Prod. Calif. For. Prod. Lab. No. 10, 1959 [2–3].

An increase in N content of the mineral soil was associated with an increase in site index of Ponderosa Pine. When N per acre (to a depth of 4 ft.) was related to site index (height at age 300), 2000 lb. N was found on site index (s.i.) 50, 5000 lb. on s.i. 130, and 9000 lb. on s.i. 195. Dubakella and Cornutt soils, commonly recognized as low-fertility serpentine and peridotite soils, showed decreases in both exchangeable K and the Ca/Mg ratio as soil depth increased. The relatively high amounts of Ca and K in the surface of these soils indicate that the forest cover tends to build up the relative quantity of these elements and thus improve site fertility.

4081. WEST-NIELSEN, G., and OKSBJERG, E. Jordanalyser ved bonitetsgrenser i hedeplantager. **[Soil analyses at site-class boundaries in heath plantations.]** *Dansk Skovforen. Tidsskr.* 44 (2), 1959 (126–52). 10 refs. [Dan.*e.e.*]

Analyses were made in Spruce plantations cutting across site-class boundaries caused by planting (1) on areas containing both old agricultural land (*A*) and old heathland (*H*) or (2) where fertilizers had previously been applied to part of the site. Results are tabulated. On (1), the younger plantations showed distinctly higher values for pH and phosphate on *A*, and inconclusive results for K, Mn and Cu; needle analyses gave N values of 1·35 for *A*, and 1·10% for *H* on one site and 1·43 and 0·96 on another, and P values of 0·15 and 0·06 and of 0·11 and 0·04. Shoot length on *A* was 3·4 times and shoot weight 4·5 times that on *H*. In an older plantation (40–50 years), although differences in growth were clearly visible, comparatively little difference in soil or in shoot analysis was found between *A* and *H*. In (2), soil analyses were made in 1954 on plots that had had various fertilizer treatments, plus cropping with legumes, in 1901–1904, and currently showing a height range of 3·5 (no fertilizer) to 13·5 m. (K + basic slag and lime). Results showed no difference between the plots in pH, P or K values.

4082. HARTMANN, F. Dynamik und Naturgesetzlichkeit im Nährstoffhaushalt des Waldes. **[The nutrient economy of the forest, its dynamics and natural laws.]** *Cbl. ges. Forstw.* 76 (1), 1959 (36–64). 4 refs. [G.e.]

An extension and elaboration of the author's theories [cf. *F.A.* 19 No. 3755] on the basis of 17 published profiles, mostly from American virgin forests.

4083. MADGWICK, H. A. I., and OVINGTON, J. D. **The chemical composition of precipitation in adjacent forest and open plots.** *Forestry* 32 (1), 1959 (14–22). 22 refs.

The chemical composition of the precipitation in 3 open plots and under 13 different forest canopies is compared for a 2-year period at an experimental forest in S.E. England. The average contents of Na, K, Ca, and Mg in the precipitation in the open are 19, 3, 11, and <4 kg./ha./year respectively, compared with 33, 24, 24, and 10 under the forest canopies. Only very small quantities of P were present in the precipitation. The data are discussed with particular reference to the nutrient cycles of forest stands, the removal of nutrients by logging, and the maintenance of soil fertility. [Cf. *F.A.* 17 No. 1203.] *Authors' summary.*

4084. SOBOTKA, A., and MATERNA, J. **Forest seedlings and mycorrhiza development on fly ash.** *Nature, Lond.* 183 (4667), 1959 (1066–7). 3 refs.

The effects of industrial fly ash on forest stands were investigated in stands near a power plant burning black coal in Central Bohemia. Spectral analysis of the soil revealed the presence of Si, Al, Mn, Fe, B, Sn, Cu, Ba, Ti, V, and Be. Analysis of vegetation on plots covered with a heavy layer of ash showed that acidophile vegetation (*Vaccinium myrtillus*, *Deschampsia flexuosa*, acid mosses) tends to give place to species that prefer a less acid environment (*Fragaria vesca*, *Brachypodium sylvaticum*, *Melica nutans*), and that the presenc eof the latter indicates a rich layer of ash. Fly ash seems, however, to have little effect on the total number of species. Laboratory tests with *Picea abies* and *Pinus sylvestris* showed that they developed identically on ash and on forest humus, and an outstanding characteristic of the plots with a heavy layer of ash is the vigorous regeneration of many broadleaved tree species. Investigations were then made to determine the occurrence and kind of mycorrhizae on the roots of natural seedling regeneration on plots with a heavy ash layer. Species investigated were *Sorbus aucuparia*, *Acer* sp., *Betula* sp., *Quercus robur*, *Larix decidua*, *Pinus sylvestris*, *Picea abies* and *Corylus avellana*. In all cases mycorrhizal development was normal.

114.6. Soil Biology

See also Nos. 4071, 4117, 4264–75, 4308, 4539, 4544.

4085. MINA, V. N. Biologičeskaja aktivnost′ lesnyh počv i ee zavisimost′ ot fiziko-geografičeskih uslovij i sostava nasaždenij. **[The biological activity of forest soils in relation to physico-geographical conditions and stand composition.]** *Počvoved.* 1957 (10), (71–9). 3 refs. [Russ.] A.P.B.

Observations were made at Mohovoe, Orel province, under a young Birch stand, in the forest-steppe zone, on the CO_2 content of soil air at various depths in undisturbed soil, in soil under an open pit 60 cm. deep, and in and under pits of the same depth refilled with soil in the natural sequence of layers (one of the last having a sealing of tarred paper at its bottom). Results indicated that CO_2 contents were higher in the lower than in the upper horizons of undisturbed soil, and that this could be attributed to downward movement of CO_2 produced in the biologically active litter and humus layers (not, as sometimes claimed, to liberation from the groundwater). In studies of the CO_2 content of soil air in a leached, heavy clay-loam chernozem at the same locality, under 28-year-old pure Spruce, Pine, Larch, Oak and Birch, there were considerable differences under the different species. The highest concentrations (0·6 – 0·9% at 10 cm., increasing to 2·3% at 2 m. depth) were found under Oak and Birch, the lowest (0·3 – 0·4% at 10 cm., and

$\ngtr 1\%$ at 2 m.) under Spruce and Pine, with intermediate values under Larch. A comparison of the amounts of CO_2 liberated at their surface by the soils in the present study (1), soils of the Derkul′ steppe (2) and soils of the central taiga in Vologda (3), showed that biological activity decreased in the order (1) to (3). The maximum rates of CO_2 liberation were about the same in (1) and (3), and the lower total for (3) is explained by the shorter growing season.

4086. Haber, W. Zur Ökologie des Bodenlebens in verschiedenen Pflanzengesellschaften. **[The ecology of soil organisms in different plant associations.]** *Ber. dtsch. bot. Ges.* 71 (9), 1958 (399–410). 14 refs. [G.g.] O.B.D.

The quantitative bacterial content of the soil, and soil respiration were measured over a growing season in 14 different plant associations (including types of Pine, Alder and Willow association) in Carinthia. Values obtained showed characteristic differences both for different plant associations and at different times of the growing season, and were related to the stage of development of the plant community and also to special site factors. [Cf. *F.A.* 19 No. 3776.]

4087. Manninger, E. Untersuchungen über die bodenbiologisch-bedingten periodischen Reaktionsschwankungen der Waldböden. **[Periodic fluctuations in the reaction of forest soils and the influence on them of soil biology.]** *Acta Agronomica Academiae Scientiarum Hungaricae, Budapest* 7 (3), 1957 (216–29). 18 refs. [G.g.russ.e.] E.M.B.

Using data from 12 different forest sites near Sopron, studies were made of the correlations between periodic fluctuations of soil pH and periodic changes in the bacteria population, the soil moisture content, and the soil temperature. Definite correlations were found between changes in the numbers of bacteria and the periodic fluctuations of the R values [soil temperature × soil m.c.; cf. *F.A.* 12 No. 58]. Optimum R values occur in summer, when pH values too are at an optimum. The relations between R and pH values are best expressed by means of an exponential curve.

4088. Mosca, A. M. Ricerche sulla microflora del suolo in un piceeto del Parco Nazionale del Gran Paradiso. **[Studies of the soil microflora in a Spruce stand of the Gran Paradiso National Park [in the Aosta valley].]** *Allionia, Torino* 3 (1), 1956 (23–67). 62 refs. [It.it.e.] O.B.D.

The soil-suspension method was used in these studies, which showed that the distribution of soil fungi varies remarkably within a single, very uniform phanerogamic community. It was possible to distinguish two groups of taxa, the one, comprising 33–44% of the total number found, regularly distributed, while the other comprised irregularly distributed taxa or those confined to micro-environments. A comparison is made of the results obtained by studying a fairly large number of soil samples (54) and making 2 plates only for each sample, with those obtained by intensive study (8 plates each) of a smaller number (18) of soil samples. The second method appeared to give a better representation of the whole fungal population. The results showed a very small value for the *Aspergillus/Penicillium* ratio, and a large number of other Moniliaceae and Phycomycetes. These characters are proper to the mycocoenosis of cool and humid climates. The small number of Ascomycetes and Tuberculariaceae-Stilbaceae, which are generally abundant where organic matter abounds, as in the humus layer of deciduous forests, is here probably related to the peculiar composition of coniferous forest litter. *From author's summary.*

4089. Dobbs, C. G., and Bywater, J. **Studies in soil mycology: mycostasis in soils.** *Rep. For. Res. For. Comm., Lond. 1957/58*, 1959 (98–104). 4 refs.

Further study of the inhibition of fungus germination and growth on forest and other soils [cf. *F.A.* 20 No. 54] has demonstrated a pronounced seasonal variation in this phenomenon during the year. Germination of spores of *Mucor ramannianus* was completely inhibited on all soils tested during the summer months of 1957, but not so during the winter, when soils were found to vary widely in this respect, some supporting growth and sporulation of the test fungus. Several forest soils that inhibited spore germination were found to stimulate growth after freezing, but this effect was not obtained with surface litters or with marine sands. In respect of the effect of adding glucose, two categories of soils were distinguished: (1) the large majority in which addition of glucose results in appreciable growth of the test fungus, and (2) those few in which it does not. These last included several strongly calcareous soils and sands, and one surface sample of low pH from Gore Heath near Wareham. That pH itself is not the determining factor was demonstrated by a series of germination tests with *M. ramannianus* on water agar, and on Beech/Oak humus soil, adjusted to a range of pH values by the addition of *N*/10 HCl or NaOH. In both series, germination was normal at all pH values between 3 and 8. Beyond these it fell off and became abnormal, being suppressed altogether at extreme values. Pure $CaCO_3$ also completely suppressed germination, but the addition of this to soil up to $\frac{1}{3}$ of its volume, raising the pH to 8·0, did not reduce it.

4090. Swart, H. J. **An investigation of the mycoflora in the soil of some Mangrove swamps.** *Acta bot. neerland.* 7 (5), 1958 (741–68). 39 refs. [E.e.] O.B.D.

Presents a study of the horizontal distribution of fungi in and round two Mangrove swamps on the island of Inhaca (Mozambique), and of correlations between nutrient levels and the nature of the fungus populations. *From author's summary.*

4091. Lang, J. Význam mnohonožek (Diplopoda) jako půdní zvířeny. I. **[The importance of Diplopoda as soil fauna. I.]** *Zool. Listy, Brno* 7 (4), 1958 (361–80 + 2 plates). 11 refs. [Cz.cz.russ.e.] O.R.S.

Includes tabulated data based on observations in 1954–56 showing the soil fauna (Vermes, Mollusca, Arachnoidea, Crustacea, Myriopoda and Insecta) present in different forest and agricultural soils.

4092. Williamson, M. H. **The separation of molluscs from woodland leaf-litter.** *J. Anim. Ecol.* 28 (1), 1959 (153–5). 2 refs.

A method is described of separating molluscs from woodland litter by sieving the leaves under water. Apparently all live molluscs that can fall through the sieve do. If too much soil is included, the method cannot be used. *From author's summary.*

4093. Märkel, K. Über die Hornmilben (*Oribatei*) in der Rohhumusauflage älterer Fichtenbestände des Osterzgebirges. (Eine boden-zoologische Studie auf standortskundlicher Grundlage). **[The oribatid mites of the raw humus of mature Spruce stands in the eastern Erzgebirge. (A soil zoology study based on site factors.)]** *Arch. Forstw.* 7 (6/7), 1958 (459–501). 44 refs. [G.g.russ.e.]

[Cf. *F.A.* 20 No. 1385.] Discusses the composition of the oribatid population in the humus of pure Spruce stands as it varies with site and with humus layer—litter (L), semi-decomposed (F), and decomposed (H) horizons. The detailed study covers 12 sites [?76 samples] separated on a climatic basis into 6 lower-slope, 3 middle and 3 ridge sites, extending from 380 to 900 m. alt. The biology of the more important groups is discussed in detail. Climate and the moisture of the L, F, H horizons control composition of the population.

4094. Gere, G. **The part played by the macro-fauna in decomposing forest-litter floor.** *Abstr.* in *Acta biol., Budapest*: *Suppl.* No. 1, 1957 (31–2). [E.] O.R.S.

Laboratory experiments with *Glomeris hexasticha*, *Chromatoiulus projectus* and *Protracheoniscus potitus* showed that only 0–7% of the food ingested is built up into the organism, the amount depending on its quality. Not more than 10% of the dry matter in litter from layer t, compared with 20% of that from layer F_1 is oxidized while passing through the intestinal tract. Humification during digestion was found to be extensive in feeding experiments with *Sinapis alba* and *Avena sativa.* Animals fed with litter containing 50% water at temperatures of 16–22° C. consumed daily amounts of dry matter, increasing with increasing temperature, equivalent to 0·5–4% of their live weight. More food was eaten in spring than in autumn and amounts eaten were also related to the extent of decomposition. Research by van der Drift [cf. *F.A.* 13 No. 903] is discussed.

4095. Dunger, W. Über die Zersetzung der Laubstreu durch die Boden-Makrofauna im Auenwald. **[The decomposition of litter by the soil macrofauna in flood-plain forest.]** *Zoologische Jahrbücher* (*Abteilung für Systematik*, *Ökologie und Geographie der Tiere*), *Jena* 86 (1/2), 1958 (139–80). 4 pp. of refs. [G.g.] O.R.S.

The investigation consisted of ecological studies in the litter and upper soil layers (0–5 cm.) of a moderately moist flood-plain forest N.W. of Leipzig, and laboratory studies on the food preferences of 14 species of the macrofauna among dry and fresh litter of 9 hardwood species, and on the quantities consumed. More than one half of the macrofauna consisted of Lumbricidae, the rest of gastropods, isopods, diplopods, Enchytraeidae and larvae of Diptera. Intestinal analyses showed that diplopods, isopods, Enchytraeidae and larvae of Diptera feed entirely, and the rest only partly, on litter. Fresh litter was preferred, especially that from species with leaves of low mechanical strength and high "specific water capacity" [defined], usually having a high N content, a low Ca/N relationship and a low humic-acid concentration. Litter quantity consumed varied with the species and weight of the consumer, the species, degree of decomposition and moisture of the litter, and the temperature and moisture of the surroundings. It was calculated that the diplopods and isopods together consumed one-third of the total annual litter of the study area.

116. Hydrology. Water Conservation, Soil Conservation and Erosion

See also Nos. 4056–9, 4251–2, 4521–4, 4527, 4529, 4589, 4592, 4705, 4739, 5425–7.

4096. Festschrift zum siebzigsten Geburtstag von Prof. Dr. H. Burger. **[Essays [on forests and hydrology] in honour of Prof. Burger's 70th birthday.]** *Mitt. schweiz. Anst. forstl. Versuchsw.* 35 (1), 1959. pp. 265 + 29 photos. Many refs. [E.G. or F., e. g. f. or it.]

Includes the following: Some aspects of watershed management research in the United States (*B. Frank*); Forest influences in world-wide application (*C. R. Hursh*); The management of catchment areas in hill regions (*E. Kirwald*) [including training of streams and torrents by technical and biological means]; Afforestation and water supplies in Britain (*L. Leyton* and *A. Carlisle*) [see separate abstract, below]; Transmission of insolation through Pine forest canopy, as it affects the melting of snow (*D. H. Miller*) [analysing U.S. research and concluding that b.a. is more closely related to interception of radiation than is crown closure [cf. *F.A.* 17 No. 11]]; Some ecological considerations of forest influences (*J. D. Ovington*); Notes on the water balance of the Sperbelgraben and Rappengraben (*H. L. Penman*) [see separate abstract]; Forest influences and watershed management in Indonesia (*M. H. Soedarma* [*Sudarmo*]); Planning of catchment-management experiments in forest hydrological research, with reference to Southern Africa (*C. L. Wicht*); Forest and water problems, from old observations to full-scale research (*K. A. Meyer*) [an historical review including the early history of the Emmental installations]; Thirty years of hydrological measurements in the Emmental (*E. Casparis*) [a summary, including the years to 1957 following the last communication [cf. *F.A.* 16 No. 2624], supported by graphs and tables]; Hydrological research in the flysch region of the Schwarzsee (*W. Nägeli*) [describing the catchments and the installations erected in 1951 and 1952].

4097. Penman, H. L. **Notes on the water balance of the Sperbelgraben and Rappengraben.** *Mitt. schweiz. Anst. forstl. Versuchsw.* 35 (1), 1959 (99–109). 6 refs. [E.e.g.f.it.]

Making the assumption that the formula $N - A \simeq V$ (where $N =$ precipitation, $A =$ run-off and $V =$ evaporation) is approximately true over a period of years, the author works out regression coefficients and standard errors from the published data [cf. *F.A.* 16 No. 2624], which in turn form the basis for correction factors to be applied to these data. On the basis of the corrected data, there was no significant difference in $N - A$ between the 55% wooded Sperbelgraben and the 18% wooded Rappengraben. A consideration of results obtained under similar conditions elsewhere, and estimates of potential evaporation based on meteorological data from Bern and Zürich, suggest that V should be 500–600 mm. p.a., which is considerably less than Burger's estimated values for these two catchments.

4098. LEYTON, L., and CARLISLE, A. **Afforestation and water supplies in Britain**. *Mitt. schweiz. Anst. forstl. Versuchsw.* 35 (1), 1959 (51–6). 9 refs. [E.g.f.it.]

Reviews the (few and conflicting) available British data on the effect of forests on total available supply, peak run-offs, etc. and reports preliminary results of a study at Oxford on interception and stemflow in a young stand of *Chamaecyparis lawsoniana*.

4099. WALDMANN, G. Schnee und Bodenfrost als Standortsfaktoren am Gr. Falkenstein (Bayer. Wald). **[Snow and soil freezing as site factors on the Grosser Falkenstein (Bavarian Forest).]** *Forstwiss. Cbl.* 78 (3/4), 1959 (98–108). 11 refs. [G.]

[Cf. *F.A.* 20 Nos. 1350–1.] Investigations in 1953–54 covered the vertical snow profile and snow depths on the most exposed slope (W.S.W.), and in early 1955 the effect of aspect, relief and forest types on the snow distribution, and the snow melt on the whole mountain. Investigations on soil freezing showed that below the snow layer on open areas and in broadleaved stands the soil was not frozen at all, and that in Spruce and Silver Fir stands it was frozen only a few cm. deep, in the places where crown drip had occurred. This confirms Priehäusser's findings [cf. *F.A.* 1 p. 126]. The labour required to obtain these data on snow and soil freezing was relatively small, and more such work is urged.

4100. WEITZMAN, S., and BAY, R. R. **Snow behaviour in forests of northern Minnesota and its management implications**. *Sta. Pap. Lake St. For. Exp. Sta.* No. 69, 1959. pp. 18. 15 refs.

Snow accumulation and melt were studied in winter 1956–57 in Red Pine, Aspen and Black Spruce forest types and comparisons made between different densities or felling methods in each type, and also between the three types and brush or open land. In conifer types, lightly stocked stands caught more snow, but dense stands retained it longer. East-west strip fellings accumulated more snow and kept it longer than any other type of felling. Stocking levels in hardwoods affected snow accumulation and melt in the same way as in conifers but to a lesser degree. Mixed stands of scattered conifers and hardwoods caught more snow than pure conifers and retained it longer than pure hardwoods.

4101. ANDERSON, H. W., RICE, R. M., and WEST, A. J. **Snow in forest openings and forest stands**. *Proc. Soc. Amer. For.* 1958 (1959), (46–50). 6 refs.

Discusses one-year results of a study in the Central Sierra, Calif., on 57 sites at 6000–8000 ft. alt., of total retention, development of snow melt etc. Retention was greater in the openings and least where growth was densest. Selective cutting, and cutting in straight or L-shaped strips according to aspect, are thought to be potential aids in watershed management.

4102. GARSTKA, W. U., *et al.* **Factors affecting snowmelt and streamflow. A report on the 1946–53 Co-operative Snow Investigations at the Fraser Experimental Forest, Fraser, Colo.** Bureau of Reclamation, U.S. Department of the Interior, Denver, Colo., and Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colo. 1958. pp. xii + 189. 104 refs.

Includes a study on the effect of forests, comparing the rate of snow melt from a 42-acre clearing (ca. 30 days) and from the surrounding forest (ca. 37). Recognition of the complex interaction of solar radiation and wind has led to the redesigning of experiments on the effect of forest management practices on water yields. Techniques and instrumentation are described and discussed in great detail.

4103. SUHAREV, I. P., and SUHAREVA, E. M. Vlijanie agrotehniki na vpityvanie vody v počvu. **[The influence of land use on water infiltration into the soil.]** *Počvoved.* 1958 (3), (95–104). 15 refs. [Russ.russ.e.] A.P.B.

Tabulates data on the infiltration of water into chernozems on the Kamennaya Steppe under various crops or types of use, indicating the density of the 0–30 cm. soil layer and the water stability of aggregates in the top 10 cm. under each type. Infiltration was related to soil structure and was highest under steppe vegetation unmown since 1882 (1470 mm. in 150 min.) and lowest on pasture (283 mm.) and an old fallow (262 mm.); for a 60-year-old shelterbelt the figure was 547 mm. In further experiments, a much higher infiltration rate was found under a 45-year-old shelterbelt than under shelterbelts 5 or 15 years old. Additional measurements were also made in the winters of 1945 and 1956 under arable fields and shelterbelts, and data are given on the moisture deficit (i.e. difference in mm. between field moisture capacity and actual m.c.) before snowmelt, depth of soil freezing, rate of snowmelt and duration of run off, and mean daily and total infiltration for the period of snowmelt. The total infiltration (mean of 9 years) was 477 mm. under shelterbelts and 41 mm. under arable fields, and was related to the moisture deficit.

4104. NOGUCHI, Y. **An approach to the hydrological seasons in the central region of Japan**. *Misc. Inform. Tokyo Univ. For.* No. 12, 1957 (205–17). 7 refs. [E.e.jap.]

Discusses methods of estimating cyclical changes in water storage etc. from records of precipitation and run-off, adjusted for evapo-transpiration and groundwater storage etc., on the basis of 10 years' data collected on a catchment of ca. 100 ha. in Aichi, with a good forest cover, mostly Pine.

4105. Reinhart, K. G. **Calibration of five small forested watersheds.** *Trans. Amer. geophys. Union* 39 (5), 1958 (933–6). 2 refs. H.S.B.

Five forested catchments ranging from 38 to 96 acres in area in W. Virginia have been calibrated since 1951. Methods used and problems encountered are discussed. Four of the catchments will eventually be felled, using 4 different felling practices, and the effects on stream flow will be measured.

4106. Burykin, A. M. O vnutripočvennom stoke v gornyh uslovijah vlažnyh subtropikov. **[Subsoil run-off in mountainous regions of the moist subtropical zone.]** *Počvoved.* 1957 (12), (90–7). 15 refs. [Russ.e.] A.P.B.

Studies on run-off and erosion on sloping ground were made at the Black Sea Experiment Station, Krasnodarsk region, on podzolic yellow earth of the coastal zone. After 62·4 mm. of rain in 3 days, the rate of surface run-off was higher on soil under forest and on a ploughed pebbly medium clay-loam than on a ploughed (non-pebbly) heavy clay-loam. Whereas soil erosion (measured as particles suspended in the surface run-off) was considerable from this last soil, it was much less from the pebbly soil and was absent under forest. As subsoil run-off occurs widely in this region, often exceeding surface run-off, plots of 10 sq. m. were established on sites with different types of plant cover or soil treatment and sprayed with water for one hour at a rate of 2·5 mm./min. Procedure and apparatus are described and results tabulated. Subsoil run-off increased with increasing slope and permeability of the soil, and in general, with increasing soil moisture. On a clear-felled site with low permeability, subsoil run-off was 17–28% less than on a permeable forest soil, and the rate of flow in permeable forest soils was twice that of more impermeable soils. It was also greater in shallowly ploughed than in deeply ploughed soil where the structure of the lower horizons had been destroyed. Erosion was significantly correlated with soil structure. Under forest, where the structure was preserved, erosion was almost completely absent in spite of high subsoil run-off; erosion was most serious on sites where stumps had been uprooted, and particularly on ploughed land. Data are also given on the chemical composition of the subsoil run-off water on ploughed land and under forest.

4107. Balsotti, L. Considerazioni tecnico-economiche sulla preparazione del terreno a gradoni nell'esecuzione del rimboschimento. **[Technical and economic considerations on soil preparation for afforestation by making *gradoni*.]** *Monti e Boschi* 10 (5), 1959 (211–6). 2 refs. [It.f.g.]

Analyses the respective costs of planting bare slopes, (*a*) with simple planting holes, and (*b*) with a system of *gradoni* [cf. *F.A.* 11 Nos. 269, 1027]. Total costs for (*a*) were L.150,000/ha., and for (*b*) L.180,000, but (*b*) gave much better survival, growth, and water conservation.

4108. Haupt, H. F. **Road and slope characteristics affecting sediment movement from logging roads.** *J. For.* 57 (5), 1959 (329–32). 3 refs.

The amount of erosion and sediment occurring below logging roads on steeply sloping granitic soil in the Ponderosa Pine lands of S.W. Idaho was investigated. Seven road and slope characteristics amenable to quantitative evaluation were studied to determine their relationship to the distance that sediment moved downhill from a road embankment. Four of these characteristics (the slope obstruction index, *Soi*; cross-ditch interval, *Cdi*, squared; embankment slope length, *Esl*; and the product of *Cdi* and road gradient *Rg*) were found to have a significant influence on the distance sediment was carried. A regression equation for the sediment flow distance, *Sfd*, was then developed: $Sfd = 1{\cdot}2871\ Soi + 0{\cdot}0030\ (Cdi^2) + 3{\cdot}4918\ Esl + 0{\cdot}0468\ (Cdi.\ Rg) - 66{\cdot}2395$, which has an S.E. of 46·7 ft. The equation promises to be valuable in determining the safe width of buffer strips necessary to protect roads or streams lower down the slopes from sediment arising from logging-road construction.

4109. Sokol, F. Povodňové škody v Moravské bráně. **[Flood damage in the Moravská Brána region [Czechoslovakia].]** *Sborn. čsl. Akad. zeměd. (Lesn.)* 5 (4), 1959 (443–60). 14 refs. [Cz.cz.russ.g.]

Describes the damage done by the river Bečva, and the causes of flooding in the area. Proposes agricultural and forestry measures to reduce flood danger, and urges the granting of substantial capital for torrent-control works.

4110. Quesnel. Action sur l'écoulement du flot des eaux de crue des plantations de crête de berge en nature de bois-taillis. **[The effect of coppice plantations at the crest of the river bank upon the stream flow of flood water.]** *C.R. Acad. Agric. France* 45 (5), 1959 (194–8). [F.] A.P.B.

Reports trials with a scale model to study the effects on streamflow of strips of coppice forest 20 and 40 m. in width, planted at the flood level of a river, on the crest of the bank of the main water channel. The trials showed that such strips will control water levels at bends in the river, increase by ca. 10% the flow in the main channel, and below bends, will diminish considerably the inequality of distribution of the flow and reduce its speed at flood level on both banks. If the coppice is felled on a 5-year cycle in strips ⅕ the width of the plantation, the plantations (on concave bends at least) do not need to be more than 25 m. wide.

4111. Widmann, M. **Control of the silting up of large reservoirs.** Working Party on Torrent Control, European Forestry Commission, FAO, Rome. 1959. pp. 7 + 18 + 16. Many refs.

Brings together reports presented to the Working Party's meetings of 1954, 1956 [see *F.A.* 17 No. 3608], and 1958 (*FAO/EFC/Torr.*15).

14. Systematic Zoology

145.7 Insecta. Entomology

See also Nos. 4834 *et seq.*, 5273 *et seq.*

4112. Mathur, R. N., and Sen-Sarma, P. K. **Hitherto unknown imago caste of the species of**

***Globitermes, Microcerotermes* and *Odontotermes* from Indo-Malayan region (Isoptera: Termitidae).** *Indian For. Bull.* (*n.s.*) No. 219, 1958. pp. 9 + 3 plates with notes. Price *Rs.* 1.25 (2*s.*)

The species described are *G. audax*, *M. burmanicus* and *O. parvidens*.

4113. VINSON, J. **Catalogue of the Coleoptera of Mauritius and Rodriguez. Parts 1 & 2.** *Mauritius Inst. Bull.* 4 (1), 1956 (1–74); 4 (2), 1958 (75–130). 67 + 45 refs.

4114. BROWNE, F. G. **Beetles: Scolytidae from Borneo. New species of *Scolytomimus* and *Webbia* (Scolytidae) from Borneo and Malaya.** *Repr.* from *Sarawak Museum Journal, Kuching* (*n.s.*) 8 (11), 1958 (487–97).

Describes 5 *Scolytomimus* and 5 *Webbia* spp., with notes on their place of collection, and for *Scolytomimus* a section on biology, listing hosts.

4115. NOSEK, J. K morfologii kukel *Xyleborus dispar* F. a *Xyleborus saxeseni* Rtzb. **[The morphology of pupae of *X. dispar* and *X. saxeseni*.]** *Zool. Listy, Brno* 7 (1), 1958 (87–90). 9 refs. [Cz.] O.R.S.

An illustrated description.

4116. GŁOWACKI, J.; PISARSKI, B. Klucze do oznaczania owadów Polski. Część XXIV. Błonkówki—Hymenoptera. Zeszyt 2. Trzpiennikowate—Siricidae. Zeszyt 3. Oryssidae. **[Key for identifying Polish insects. XXIV. Hymenoptera. Part 2—Siricidae. Part 3—Oryssidae.]** Polski Związek Entomologiczny, Warszawa. No. 14, 1956. pp. 27. 13 refs. [Pol.]

Systematy and morphology of the Siricidae (7 genera, 16 species), and of the Oryssidae (3 species).

15. Animal Ecology. Game and Fish Management, Hunting, Shooting and Fishing

See also Nos. 4305, 4525, 4732, 4819–33.

4117. BALOGH, J. Lebensgemeinschaften der Landtiere. **[Communities of terrestrial animals.]** Akadémiai Kiadó, Budapest. 1958. pp. 560. 27 pages of refs. [G.] Price [£2 5*s*.]

The book, a second revised edition of the author's *Grundzüge der Zoozönologie*, 1953, covers concepts and terminology of biocoenology, its relation to ecology and biology, factors of biocoenotic analysis, etc., and, in considerable detail, methods of investigation, collection, evaluation, laboratory work etc. with special reference to invertebrates on and in the soil and vegetation.

4118. FERRY, C. Études quantitatives sur les oiseaux forestiers. **[Population studies on birds in [French] forests.]** *Rev. for. franç.* 11 (3), 1959 (173–85). 19 refs. [F.]

A study of variation in abundance of several species with the age of Oak/Hornbeam coppice-with-standards.

4119. VANĚK, J. Sezónní narůstání potravy zvěře na habrovém podrostu (keřovém patru). **[Seasonal growth of browse in Hornbeam regeneration (bush stage).]** *Sborn. čsl. Akad. zeměd.* (*Lesn.*) 4 (6), 1958 (501–14). 25 refs. [Cz.cz.russ.g.]

In continued experiments [cf. *F.A.* 20 No. 1418] the minimum twig weight was found in Nov., the maximum leaf weight in Sept. New leaves grew if defoliation occurred before Aug., but (except after defoliation in May and July) were smaller than normal.

16. General Botany

160. Plant Chemistry

See also Nos. 4256, 4260, 4520, 4561, 4587–8, 4815, 5142 *et seq*., 5365 *et seq*.

4120. OVINGTON, J. D., and MADGWICK, H. A. I. **The sodium, potassium and phosphorus contents of tree species grown in close stands.** *New Phytol.* 57 (3), 1958 (273–84). 14 refs.

Studies were continued in 3 plantations [cf. *F.A.* 19 No. 70]. All the 34 boles sampled showed an increase, small but consistent in the lower part, and very marked in the top 3–5 m., in %, on a dry-weight basis, of Na, K and P, with increasing height in the tree. Crowns were less intensively sampled, but in most trees there was an increase in mineral content with height in the tree, and the average content of the 3 elements for each tree crown as a whole were greater than bole averages. The increase in concentration of the 3 elements up the trees is greatly reduced when the elements are expressed as %s of ash weight. Considerable differences in total nutrient content were found between species, but relatively small ones between trees of the same species from the same plot. In nearly all trees, conifers contained greater weights of Na, K and P than hardwoods of the same age in similar conditions; stands of conifers also tended to contain greater weights of Na, K and P per unit area than neighbouring hardwood stands, though the differences were smaller than for sample trees. Calculated figures are given showing the Na, K and P in kg./ha. in the woodland ecosystems (canopy, boles, thinnings, ground flora and litter) in relation to exchangeable nutrients in the forest soil; there was little evidence that a higher net uptake of nutrients by trees and ground flora results in smaller amounts of nutrients in the mineral soil, and at Bedgebury and Abbotswood the plots with the largest amounts of nutrients in the trees tended also to have the largest amounts in the soil. The balance of nutrients in woodland soil is briefly discussed and the need for further studies stressed. [Cf. *F.A.* 20 No. 5027.]

4121. KARSCHON, R. **Levels of trace elements in Eucalypt leaves.** *Leafl. Dep. For. Israel* No. 7, 1959. pp. 2. 6 refs. [E.]

Tabulates the amounts of Fe and Mn in leaves of *Eucalyptus rostrata*, and of B, Cu, Fe, Mn and Zn in those of *E. gomphocephala*, from trees on both calcareous and non-calcareous soils.

4122. FRIEDE, H. M. **Trees and shrubs as indicators of ore.** *Trees S. Afr.* 10 (3), 1958 (50–1). 8 refs.

4123. LEWIS, Y. S., and NEELAKANTAN, S., **Synthesis of tartaric acid in Tamarind leaves.** *Curr. Sci.* 28 (4), 1959 (152–3). 7 refs. A.P.B.

Presents a graph illustrating the tartaric-acid content of *Tamarindus indica* leaves through April to January. Total and free tartaric acid are at their maximum in the fresh foliage. As the fruit grows bigger it takes up most of the excess acid from the leaves, in addition to synthesizing some of its own, and the free acid content of the leaves ultimately falls to zero.

4124. HIDA, M. **[Studies on anthocyanidin and leucoanthocyanidin in autumnal red leaves and green leaves of the conifers.]** *Bot. Mag., Tokyo* 71 (845/846), 1958 (425–9). 16 refs. [Jap.e.*e.*] I.M.I.

[Cf. *F.A.* 17 No. 3624.] A table in English summarizes, from paper chromatography and spectrophotometry, the presence and absence of cyanidin and delphinidin in the green and coloured leaves of 47 species and varieties (8 families) and of *Metasequoia* scions on stocks of *Crytomeria, Sequoia* and *Sequoiadendron.* Among Pinaceae there are more species containing leuco-delphinidin alone than species containing both delphinidin and cyanidin, while the production of both is commoner in the Taxodiaceae and Cupressaceae. *Metasequoia*, which produces both, appears on this ground to be more closely related to *Sequoia* and *Sequoiadendron* than to *Cryptomeria.*

4125. SEAKINS, J. W. T. **Chemistry of condensed tannins.** *Nature, Lond.* 183 (4669), 1959 (1168–9).

[Cf. *F.A.* 20 No. 1423.] Summarizes papers read (and discussions) at a meeting of the Plant Phenolics Group held in London on 6 Jan., 1959. These include: Acid-catalysed polymerization of phenolic compounds (*B. R. Brown*); Oxidative polymerization mechanisms for catechins (*D. E. Hathway*) [including data on *Acacia catechu* heartwood and Oak bark tannin]; Methods for the investigation of complex leucoanthocyanins (*T. Swain*); The formation of condensed tannins in plants (*W. E. Hillis*) [Shikimic acid (s.a.) is present in appreciable quantities in the actively proliferating cambium of Eucalypts. A linear relation exists between the amounts of s.a. and the weights of enlarging leaves of young *Eucalyptus sieberiana* trees, but this relationship does not hold for the fully grown leaf. The final stages of the biosynthesis of s.a. can occur in the dark, and therefore s.a. elsewhere in the tree need not necessarily originate in the leaves. Comparative studies of the polyphenols in the cambium, sapwood, and heartwood of 3 *Eucalyptus* spp. revealed the same general pattern of polyphenols, but s.a. was absent from the heartwood and only traces occurred in the developing sapwood. Catechin was less in the heartwood whereas ellagic and gallic acids increased. On the basis of these facts a possible scheme for the biosynthesis of the heartwood phenols is outlined]; Flavans of the resorcinol series in relation to the chemistry of commercially important condensed tannins (*D. G. Roux*) [The stereochemistry of Black Wattle catechin and Quebracho heartwood was discussed. The progress of condensation of the compounds in wood was examined by anthocyanidin formation, by average molecular weights, and by tannin analyses on radial and vertical drillings. These methods afford possible biochemical evidence of the presence of leucoanthocyanidins as intact flavan-3:4-diol units in these condensed tannins].

4126. PLOUVIER, V. Sur la recherche des éthers methyliques des inositols dans quelques groupes botaniques. **[The methyl ethers of the inositols of some botanical groups.]** *C.R. Acad. Sci., Paris* 247 (25), 1958 (2423–6). 3 refs. [F.f.] O.R.S.

Groups studied were conifers, Ulmaceae, Proteaceae and Cistaceae. Results included the isolation of *d*-pinitol and sequoyitol from conifers (including the cones of Pinaceae), of *l*-quebrachitol from leaves of *Celtis* spp. and *Pteroceltis tatarinowii*, and of *l*-bornesitol from leaves and twigs of *Banksia integrifolia.*

4127. TSUKAMOTO, T., *et al.* **[Studies on the sterols from *Phellodendron amurense* Rupr. (1). Isolation of β-sitosterol and γ-sitosterol.]** *J. pharm. Soc. Japan* 78 (10), 1958 (1099–1101). 2 refs. [Jap.e.*e.*] O.R.S.

4128. NISHIOKA, I. **[Studies on the sterols from *Phellodendron amurense* Rupr. (2). Isolation of 7-dehydrostigmasterol.]** *J. pharm. Soc. Japan* 78 (12), 1958 (1432–4). [Jap.e.*e.*] 5 refs. O.R.S.

4129. BINNS, S. V., *et al.* **The chemical constituents of Australian *Flindersia* species. X. The constituents of *F. dissosperma* (F. Muell.) Domin and its relationship to *F. maculosa* (Lindl.) F. Muell.** *Aust. J. Chem.* 10 (4), 1958 (480–3). 5 refs. O.R.S.

The constituents of leaves, bark and wood of *F. dissosperma* and *F. maculosa* have been isolated and identified. The chemical evidence supports the view that these two species and *F. collina* are closely related. *From authors' summary.* [Cf. *F.A.* 17 No. 2268.]

4130. HEGARTY, M. P. **The isolation and identification of 5-hydroxypiperidine-2-carboxylic acid from [leaves of] *Leucaena glauca* Benth.** *Aust. J. Chem.* 10 (4), 1958 (484–8). 11 refs. O.R.S.

161. Physiology

See also Nos. 4056–9, 4083, 4120–1, 4123–5, 4172, 4181–2, 4194–5, 4249 *et seq.*, 4744–6, 4800, 4815, 4913.

4131. **Annual review of plant physiology. No. 10.** Annual Reviews Inc., Palo Alto, Calif. 1959. pp. 483. Many refs. Price $7.00 in U.S.A., $7.50 elsewhere.

Includes the following review articles, containing many references to forest trees: Foliar absorption of mineral nutrients (*S. H. Wittwer* and *F. G. Teubner*); Leaf proteins (*N. W. Pirie*); Light-induced reactions of bacterial chromatophores and their relation to photosynthesis (*A. W. Frenkel*); The structure of the chloroplast (*J. J. Wolken*); Active transport of salt into plant tissue (*G. G. Laties*); Respiratory mechanisms in higher plants (*D. P. Hackett*); Photoperiodic control of floral induction (*J. Doorenbos* and *S. J. Wellensiek*); The lignins (*R. E. Kremers*); Fat metabolism in higher plants (*P. K. Stumpf* and *C. Bradbeer*); The Pine tree (*N. T. Mirov* and *R. G. Stanley*); Physiology of virus diseases (*F. C. Bawden*); Plant chemotherapy (*A. E. Dimond* and *J. G. Horsfall*); The macronutrient elements (*T. C. Broyer* and *P. R. Stout*); Nitrogen nutrition (*R. H. Burris*); Metabolism of carbon compounds (*M. Gibbs*); The chemical regulation of growth (some substances and extracts which induce growth and morphogenesis) (*F. C. Steward* and *E. M. Shantz*); Auxins and fungi (*H. E. Gruen*); Phototropism and phototaxis (*J. Reinert*).

4132. COCHRANE, V. W. **Physiology of fungi.** John Wiley & Sons Inc., New York, and Chapman & Hall Ltd., London. 1958. pp. vii + 524. Many refs. Price £3 18*s*.

Summarizes present knowledge and indicates some future problems, excluding work on yeasts except where it has a direct bearing on the physiology of true fungi; with chapters on: methods of cultivation and growth; the composition of cells; C, N and inorganic nutrition and metabolism; respiration; vitamin requirements; reproduction; spore germination; and the action of physical and chemical agents.

4133. POSTLETHWAIT, S. N., and ROGERS, B. **Tracing the path of the transpiration stream in trees by the use of radioactive isotopes.** *Amer. J. Bot.* 45 (10), 1958 (753–7). 9 refs. O.B.D.

Radioactive I and P were used in stems of *Carya ovata*, *Pinus resinosa* and *Carpinus caroliniana*. The experiments with P^{32} showed that it would pass readily round variously oriented deep cuts made in the stem during the growing season, but not round cuts made in March before flushing. The path of the transpiration stream could be made to move alternately from one side of the tree to the other, by means of appropriately placed cuts. *From authors' summary.*

4134. SCHÖNNAMSGRUBER, H. Die Aufnahme der Phosphorsäure aus Thomasphosphat durch junge Holzpflanzen. **[The uptake of phosphoric acid from basic slag by young woody plants.]** *Phosphorsäure, Essen* 18 (1), 1958 (24–41). 22 refs. [G.g.]. H.S.B.

Uptake of labelled P from basic slag, 3 g. slag to 1 kg. soil per pot, was tested on (*a*) a poor keuper sand, (*b*) a loess loam, and (*c*) a heavy clay, using 2-year-old seedlings of 7 conifers and 8 hardwoods. When the slag was applied to the surface and well watered in, radiation impulses were noted on the top of 30- to 35-cm. Spruce plants after ca. 20 min. on (*a*), both speed and intensity of uptake being slightly less on (*b*) and (*c*). Working in the slag to a depth of 5 cm. increased intensity of uptake, particularly with (*b*) and (*c*), and total mixing (involving removal and replanting of seedlings) even more so, eliminating the differences between the soils. Most species gave quicker responses when the slag was worked in, varying in degree with the soil. *Alnus glutinosa* responded uniformly well on all soils, even with surface treatment only. In sand and water culture tests (with Spruce only) uptake was adequate at all pH levels tested (3·5, 5·5 and 7·5) and highest at 5·5. The influence of artificial light in increasing P uptake, and the removal of assimilates from leaves at night, could be observed in some species. Uptake declined after 40 days in Beech and *Acer platanoides*, but not in *Ailanthus altissima*, the species showing the highest intensities and translocation rates (170–180 cm./hr.). The lowest rates (10–15, and 12–17 cm.) were shown by *Sequoia gigantea* and *Quercus cerris*, and the highest rate among conifers (120–130) by *Metasequoia glyptostroboides*. [Cf. *F.A.* 17 No. 1202.]

4135. BARNER, J. Organographische, ökologische und physiologische Komponenten, die die Wurzelaufnahme radioaktiven Phosphates von Forstpflanzen bestimmen (Ergebnisse von Untersuchungen an der Weisstanne *Abies alba*). **[The influence of organ structure, ecology and physiology on the uptake of radioactive phosphates through the roots of forest plants (results of investigations on *A. alba*).]** *Forschungsergebnisse zur Förderung der forstlichen Erzeugung, Bundesministerium für ELF* (*AID*), *Hiltrup* (*Landwirtschaftsverlag*) No. 2, 1958 (18–38, 90, 93, 95). [G.g.e.f.]

Describes in greater detail experiments already covered [see *F.A.* 18 No. 84] and, in addition, experiments with plants grown originally either in shade or in the open and then brought under identical light conditions. Under uniform light of 1000 luxes, a shade plant showed less, and less variable, uptake of P^{32} than a light plant, as measured by radiation on the end of branches and as shown by contact radiographs of sections of roots, shoots, and needles. When, later, light and shade plants were brought into the open, the latter developed greatly increased respiration and also epidermic lesions followed by cell regeneration associated with a concentration of P_2O_5.

4136. SMOLA, J. Príspevok k poznaniu transpirácie tatranského smreka. **[The transpiration of Tatra Spruce.]** *Sborn. Prác Tatr. Nar. Parku, Tatr. Lomnica* No. 2, 1958 (48–60). 7 refs. [Slovak.slovak.russ.g.]

Transpiration measurements were made by (1) the photometer method, and (2) Ivanov's rapid-weighing method, on one 30-year Spruce, 7·3 m. high, growing at 1360 m. alt., the needles of which averaged 35·7 ± 1·01 sq. mm. in surface area (total number of needles on tree, ca. 3·7 million, with 1155·4 million stomata; total needle area 132·09 ± 3·74 sq. m.). With r.h. 77·06%, temperature 14° C., cloud cover 54·8%, moisture deficit 2·78, and no wind, method (1) indicated, by extrapolation, a daily transpiration rate of 3·7 litres for the whole tree; with a maximum moisture deficit of 9·22, the rate was 12·05 litres/day. Maximum values obtained by method (2) indicated that the tree could transpire 23·058 litres/day, but as this is considered physiologically impossible, the maximum values obtained by method (1) are considered to be the maximum transpiration under the conditions given.

4137. ROUSSEL, L. L'activité photosynthétique des résineux pendant la mauvaise saison. **[Photosynthetic activity of conifers during winter.]** *Rev. for. franç.* 11 (3), 1959 (218–23). [F.]

Briefly reviews the available information [without exact literature references].

4138. BOURDEAU, P. F. **Seasonal variations of the photosynthetic efficiency of evergreen conifers.** *Ecology* 40 (1), 1959 (63–7). 9 refs.

Net photosynthesis (CO_2 uptake less CO_2 output) under uniform light and temperature conditions was measured on excised current-growth twigs taken over a whole year from 2 *Picea abies* and 2 *P. pungens* growing at Valhalla, N.Y. Negative in May, soon after bud opening, it became positive in June, increased to the end of October or November, and decreased to about nil after the first sharp frosts, to rise again to autumn levels from mid-March onwards, until respiration at flushing reversed the balance. Respiration, initially very high, declined first sharply, then slowly to a minimum in January-February. Chlorophyll content rose till October, then declined to December, rising again slightly in spring. A similar pattern was observed with potted *Tsuga canadensis* and *Pinus sylvestris* grown out of doors, independent of illumination (natural or 16-hour days), while comparable trees kept in a greenhouse at minimum of 15° C. showed only a slight though significant decrease in net photosynthesis under both illumination regimes, and had a higher chlorophyll content throughout. When Pines were brought into the greenhouse in March, they changed from a negative to a positive pattern within 48 hours. The seasonal fluctuations in photosynthetic capacity, with a marked winter minimum, indicate that the evergreen habit does not necessarily enable conifers to carry on appreciable photosynthesis during the cold season.

4139. MCGREGOR, W. H. D. **Seasonal changes in the rates of photosynthesis and respiration of Loblolly Pine and White Pine.** *Abstr. of thesis*, in *Dissert. Abstr.* 19 (10), 1959 (2418–9). O.R.S.

Seasonal trends of potted seedlings were studied by measuring CO_2 exchange with an infra-red gas analyser at intervals throughout the year. From February the rate of photosynthesis increased, reached a peak (mid-September for Loblolly (*a*) and July 15-Sept. 15 for White Pine (*b*) seedlings), and then declined rapidly. The increase began before new needles emerged and the autumn decline was not accompanied by appreciable loss of foliage. Respiration of (*a*) increased steadily throughout the year, whereas that of (*b*) increased during plant growth, then decreased, and again increased during the winter. Stem elongation of (*b*) was essentially complete by May 15, that of (*a*) continued steadily until Sept. 10. Efficiency of photosynthesis per unit of fascicle length reached a maximum in July for (*b*) and in May for (*a*), declining after Sept. in both. Respiration rate per unit of fascicle length in both species increased markedly early in April, with the initiation of spring growth, decreased to a minimum in Sept. and again increased during the winter. Total chlorophyll per seedling reached a maximum in Sept. for both species, declining slightly during the winter, and that per unit of fascicle length increased in spring, showed a slight mid-season drop, and reached a second peak in Sept. Photosynthesis per unit of chlorophyll showed a maximum efficiency in May for (*a*) and in July for (*b*). The effect of photoperiod on the rates of photosynthesis and respiration of (*a*) from Georgia and Florida were also studied [cf. *F.A.* 20 No. 149]. At the light intensity (4,000 ft.-candles) studied, optimum temperature for photosynthesis for both species was 20–25° C., the rate above 25° decreasing much more rapidly in (*b*); respiration continued to increase above 40°. The C^{14}-labelled products of photosynthesis did not change with temperature but increased in number with time. It was calculated that (*a*) could accumulate twice as much C annually as (*b*) seedlings. Climatic conditions in the Durham, N.C., area, especially temperature, affect photosynthesis and respiration of (*b*) seedlings in such a way as to reduce the net assimilation of C below the minimum for successful competition or survival; this may be a major factor in limiting its southern range.

4140. FERCHAU, H. A. **Ecotypic variability of *Tsuga canadensis*: photosynthesis and related processes.** *Abstr. of thesis*, in *Dissert. Abstr.* 19 (10), 1959 (2440). O.R.S.

Seedlings of ecotypes were grown in the field to determine seedling survival and the influence of photoperiod under local [N. Carolina] conditions, shoot/root and related ratios and variations in chlorophyll content, and under greenhouse or controlled conditions to determine variability in rate of photosynthesis and respiration as related to several environmental factors. Field studies indicated that in local conditions seedlings may grow well. Extended day-length tended to increase the growth of all geographic races used. The chlorophyll in the needles was related to environmental conditions of the seedlings rather than to geographic origin, and in field studies was lower and in the greenhouse compared favourably with that of other plants. It tended to be lowest with low light intensity (500 ft.-candles) at 75°–80° F. The peak for photosynthetic efficiency was at a higher light intensity for an ecotype from Tennessee than for one from New York. Tennessee seedlings grown in a constant-temperature room had a peak of photosynthetic activity at a lower light intensity than those grown in the greenhouse. There was a marked decrease in the rate of photosynthesis associated with dormancy.

4141. POLSTER, H., and NEUWIRTH, G. Assimilationsökologische Studien an einem fünfjährigen Pappelbestand. **[Assimilation-ecological studies in a 5-year Poplar stand.]** *Arch. Forstw.* 7 (10/11), 1958 (749–85). 54 refs. [G.g.russ.e.]

Using an infra-red absorption recorder [cf. *F.A.* 18 No. 87] and a battery of self-recording and other meters, the assimilation rate and concomitant site factors (*a*) rainfall, (*b*) light, radiation, sunshine etc., (*c*) air temperature, (*d*) air humidity and saturation deficit, (*e*) wind, (*f*) soil moisture and (*g*) soil water tension [cf. *F.A.* 20 No. 4056] were measured in a dense leafy stand of this strongly transpiring genus on a soil of poor water-retention over one growing season (April-Sept.), the first (dry) and second (wet) halves of which were separated by a 14-day drought. The stand consisted of 7-m. stems, spaced 1 × 1 m., in 16 N.-S. rows of 6 stems, each row from a single clone. The effects of watering (100 mm. rain equivalent) in comparable clone pairs on the southern edge of the stand was also studied and the mean heights and diameters of the lines of stems (from N. to S.) are tabulated. The effect of factors (*a*)-(*g*) on assimilation in relation to the position of the leaf in the crown (apex, or base), and of the tree line (S. edge, inner, and N. edge) are discussed in detail and the variation through the season and through days of sample weather is fully illustrated in graphs.

4142. KETSKHOVELI, E. N. **Change with time of the dynamics of chlorophyll in the bark of trees.** *Soobščenija Akademii Nauk Gruzinskoj SSR, Tbilisi* 21 (2), 1958 (179–81). [Russ.?] From *abstr.* in *Chem. Abstr.* 53 (9), 1959 (8327). P.R.

Chlorophyll was extracted from the tissue between the cork layer and the wood and the amount (ch.) colorimetrically determined. The species investigated were divided into 3 groups according to change with time of the dynamics of ch. formation in the bark. Group 1 includes plants such as *Ligustrum*, in which ch. increases to a maximum in 5 years, and *Betula verrucosa*, reaching a maximum in 3–4 years, after which it decreases and then remains constant. Group 2 includes *Albizzia julibrissin* and *Sterculia platanifolia* whose maximum ch. occurs in 2-year-old branches, after which ch. decreases. Group 3 includes *Populus nigra* and *Ailanthus altissima* in which maximum ch. occurs in 1-year-old branches, and then gradually decreases. In *P. nigra*, ch. decreases to the 5th year and then remains constant. In the green layer of the bark, ch. was rather high, but the change in its dynamics with time did not differ from that in the [whole?] bark.

4143. PARKER, J. **Seasonal variations in sugars of conifers with some observations on cold resistance.** *For. Sci.* 5 (1), 1959 (56–63). 17 refs.

[Cf. *F.A.* 20 No. 2749.] Sucrose, glucose and fructose, often found in the warmer months, usually increased in winter in the bark and leaves of 6 conifers investigated in New York State. Suspected raffinose and stachyose increased in autumn to early winter in the bark of all and in the leaves of some of these. Similar increases of these two sugars occurred in deciduous hardwoods (6 spp.) but not in broadleaved evergreens. In *Pinus strobus* (one tree) the branch- and root-wood contained 4 or 5 of these sugars in winter and only sucrose in summer, at the levels sampled. In the branch- and root-bark, all 5 sugars markedly increased in winter while starch reached minima in midsummer throughout the tree and in winter in the aerial parts only. Leaves of *P. palustris* seedlings (exotic, from the deep South), grown in the open, did not develop in winter the high sugar content, freezing resistance or indication of stachyose found in *P. strobus*, similarly grown. Greenhouse seedlings of both species had in winter less sugar and more starch and less cold resistance than those grown in the open though their hardiness increased somewhat in spring.

4144. WOODS, F. W., HARRIS, H. C., and CALDWELL, R. E. **Monthly variations of carbohydrates and nitrogen in roots of sandhill Oaks and wiregrass.** *Ecology* 40 (2), 1959 (292–5). 8 refs.

In a 3-year study in the sandhills of western Florida, carbohydrate food reserves in the roots of *Quercus laevis* and *Q. incana* were found to reach their lowest ebb between late April and early May, at a time when the new leaves were reaching full size. The major N-depletion period generally coincided with that of carbohydrates, but lasted until about the first week in July. Cutting the tops from Oaks caused the carbohydrates of the roots to remain low for at least 12 weeks. From these results it appears that late April or early May is the best time to start control measures on these Oaks, which must be eliminated in order to obtain satisfactory establishment of planted Pine.

4145. AUDUS, L. J. **Plant growth substances.** Leonard Hill Ltd., London. 2nd ed. (rev.) 1959. pp. 553 + 34 plates. 65 pp. of refs. Price £3 5*s.* 0*d.*

[Cf. *F.A.* 15 No. 1082.] The chapters on the chemistry of auxins, and abscission have been expanded, the chapter on hormones and reproduction has been largely revised, and new chapters are included on specific factors for the growth of organs, and the mechanism of action of the auxins. Some information is given on the new kinds of organic chemical (not of the auxin type) developed for selective weed control.

4146. WESTING, A. H. **Effect of gibberellin on conifers: generally negative.** *J. For.* 57 (2), 1959 (120–2). 12 refs.

Summarizes recent literature [cf. *F.A.* 18 No. 1293; 19 No. 2705], dealing mainly with N. American conifers.

4147. FRANSSON, P. **Studies on a shoot and root cell elongation stimulator in *Pinus sylvestris*.** *Physiol. Plant., Copenhagen* 12 (1), 1959 (188–98). 31 refs.

[Cf. *F.A.* 15 No. 82.] An auxin from *P. sylvestris* seedlings stimulating growth in oat coleoptiles and wheat root cells was compared with IAA. (1) The auxin showed stronger activity in an agar of pH 5·6 than in one of 2·7, whereas IAA activity remained constant. (2) The relation between growth activity and concentration was different for each. (3) The diffusion coefficient through agar (pH 5·6) of the auxin was 0·749, and of IAA 0·583, and this value for Pine auxin remained virtually the same after double diffusion experiments.

4148. TANAKA, K. **The pollen germination and pollen tube development of *Pinus densiflora* Sieb. et Zucc. II. The growth-inhibiting substances in the ether extract from *Pinus* pollen grains.** *Science Reports, Tohoku University, Ser. 4 (Biology), Sendai* 24 (1), 1958 (45–54). From *abstr.* in *Biol. Abstr.* 33 (5), 1959 (No. 19467).

The growth-inhibiting substances in the pollen grains of *P. densiflora* were tested on pollen grains of *Tradescantia* sp. and *Impatiens balsamina*. The ether extract from the Pine pollen inhibited the growth and protoplasmic streaming of the pollen tubes of the test species and also caused more frequent plasmolysis of the tubes. The growth-inhibiting activities were found mainly in the acidic and phenolic fractions. Since these inhibitors inhibited the growth of *P. densiflora* pollen itself, it is supposed that they may play a role in the very slow growth of the Pine pollen tube. *From author's summary.*

4149. Reines, M. **The initiation of cambial activity in Black Cherry**. *For. Sci.* 5 (1), 1959 (70–3). 10 refs.

Prunus serotina was disbudded or top-girdled in February and treated trees and controls were tested manually for cambial activity by the bark slippage (confirmed microscopically) of disks cut from 5 levels on 13 dates in April-May. Disbudding retarded cambial activity in this species, but not in *Carya glabra* similarly treated. Top girdling of the Cherry impeded its cambial activity below the girdle only, suggesting for the Cherry a basipetal movement of growth substance originating in active buds and for the Hickory, a stimulation by growth substances independent of the buds.

4150. Osborne, D. J. **Control of leaf senescence by auxins**. *Nature, Lond.* 183 (4673), 1959 (1459–60). 10 refs.

[Cf. *F.A.* 19 No. 4387.] It has now been clearly demonstrated that the application of a suitable formulation of either 2,4-D or 2,4,5-T will prevent normal senescence in both attached and detached leaves of a number of temperate deciduous species. Most of the experiments were done with *Prunus serrulata senriko* and the experimental procedure is described in detail.

4151. McWilliam, J. R. **Bioelectrical phenomena in relation to pollination in *Pinus***. *Silvae Genet.* 8 (2), 1959 (59–61). 13 refs. [E.e.g.f.]

Freshly pollinated ovules show a greater concentration of pollen round the rim and the arms of the micropyle than on any other surface of the strobilus. Investigations were therefore undertaken on Austrian Pine to find whether electrical phenomena are involved in this non-random distribution of pollen. The terminal bud and the strobilus were found to be electro-positive in relation to more basal regions of the stem. A high % of the pollen was shown to be carrying a negative electrostatic charge. There was no evidence, however, to support the view that electro-potential gradients set up between the pollen and the receptive strobilus are responsible for directing the pollen to the micropyle. *From author's summary.*

4152. Guitton, Y. Sur le métabolisme azoté des gymnospermes. Variations de l'activité arginasique et de la teneur en certains aminoacides au cours de la germination des graines de *Pinus pinaster* Sol. **[The N metabolism of gymnosperms. Variations in arginase activity and in the content of some amino acids during germination of seeds of *P. pinaster*.]** *C.R. Acad. Sci., Paris* 248 (4), 1959 (590–2). 2 refs. [F.f.] O.R.S. [Cf. *F.A.* 19 No. 1356.]

163. Embryology

4153. Francini, E. Ecologia comparata di *Pinus halepensis* Mill., *Pinus pinaster* Sol. e *Pinus pinea* L. sulla base del comportamento del gametofito femminile. **[A comparison of the ecology of *P. halepensis*, *P. pinaster* and *P. pinea* based on the behaviour of the female gametophyte.]** *Ann. Accad. ital. Sci. for.* 7, 1958 (107–72 + many photos). 60 refs. [It.f.]

Discusses in great detail the essential differences in the development of the gametophyte of the three species observed, after an examination of their geographical distribution and ecological requirements. An interpretation is made of the apocytial phase of gametophyte development showing that, while in each case this occurs in the winter season, *P. halepensis* and *P. pinaster* reveal their true Mediterranean character by beginning their series of conjugate divisions from the unicellular gametophyte in late autumn. With *P. pinea*, these divisions occur in early summer, thus indicating its essentially non-Mediterranean character.

164. Morphology

See also Nos. 4175–7, 4283–4, 4298.

4154. Dylis, N. V. O proishoždenii brahiblast u *Larix*. **[The origin of brachyblasts in Larch.]** *Dokl. Akad. Nauk SSSR* 122 (1), 1958 (138–41). 6 refs. [Russ.] A.P.B.

From an examination of *Larix* spp. in E. Siberia and the Far Eastern U.S.S.R. two types of shoot are distinguished: (*A*) bearing small, roundish or oblong, usually short-lived (≯10–12 years) brachyblasts, and (*B*) with long, cylindrical brachyblasts which often persist for 25–30 years. Shoots of type (*A*) are usually vigorous and show annual extension growth; they are found on open-grown trees, in the upper crown in forest trees of Kraft tree classes I-III, and generally where conditions for growth are good. Type (*B*) are shoots of poor or arrested growth occurring on suppressed trees, trees in very dense stands, in the lower crown on trees of classes I-III, and especially on stunted trees in unfavourable sites. From the evolutionary point of view, the development of brachyblasts is seen as an adaptation to more severe conditions of climate and site. It is noted in passing that a similar connexion between longevity of needle-bundles and severity of conditions for growth appears to exist in species of *Pinus*.

4155. Valle, G. Osservazioni sulla morfologia dei rami di un anno in abito invernale in alcune 'cultivar' di *Castanea sativa* Mill. **[The morphology of 1-year-old branches of some cultivars of *C. sativa* in winter.]** *Pubbl. Cent. Stud. Castagno, Firenze* No. 5, 1959 (65–94). [It.it.f.e.g.]

By a system based on the frequency of some characters, particularly the morphological variability of the bud, the author shows that some of them are often to be found in most of the commonly cultivated strains. The detailed study of bud morphology is illustrated by 80 photographs.

4156. DONOVAN, L. S., MAGEE, A. I., and KALBFLEISCH, W. **A photoelectric device for measurement of leaf areas.** *Canad. J. Pl. Sci.* 38 (4), 1958 (490–4). 6 refs. O.R.E.

Leaves are placed between a fluorescent light source, high in the red spectrum, and a photo cell covered with an F29 red light filter. The reduction in output of the cell, as measured by a galvanometer, is interpreted in terms of leaf area.

4157. KLEIN, W. M. **Cotyledon variations in *Juniperus occidentalis* Hook.** *El Aliso* 4 (1), 1958 (129). L.S.

After 1½ months, seedlings grown in the Rancho Santa Ana Botanic Garden from seed from (*a*) northern and (*b*) southern California showed marked variations in cotyledons. In (*a*), 27 of the 28 seedlings had 2 cotyledons, in (*b*) only 1 had 2 cotyledons, most had 3, and 18% had 4. The cotyledons of (*a*) were on average 5·38 mm. longer than those of (*b*), and differences in colour and width were also noted. As trees in the two regions show considerable difference in habit, the data presented may help in working out the ecotypes of this species, which ranges from S. California to Washington.

4158. NARAYANA, L. L. **Floral anatomy of Meliaceae—I.** *J. Indian bot. Soc.* 37 (3), 1958 (365–74). 10 refs. O.B.D.

Describes the floral anatomy of *Melia azedarach*, *Swietenia mahagoni*, *Cedrela toona*, *Walsura piscidia* and *Aglaia roxburghiana*.

4159. NARAYANA, L. L., and SAYEEDUDDIN, M. **Floral anatomy of Simarubaceae—I.** *J. Indian bot. Soc.* 37 (4), 1958 (517–22). 9 refs. O.B.D.

Describes the floral anatomy of *Quassia amara* and *Ailanthus excelsa*.

4160. ROY, S. K. **Regulation of morphogenesis in an Oleaceous tree, *Nyctanthes arbor-tristis*.** *Nature, Lond.* 183 (4672), 1959 (1410–1). 2 refs.

Measurements were made in Calcutta on flowers falling from 3 trees in 1955–56 and from 17 trees in 1957, with special reference to variation in number of petals. The standard deviations increased systematically through a season; while means changed by only ca. 2–4%, S.D. changed by 20–40%. The regulatory process involved is discussed.

4161. ERDTMAN, G. **Pollen and spore morphology/plant taxonomy. Gymnospermae, Pteridophyta, Bryophyta (illustrations). (An introduction to palynology. II.)** Almquist & Wiksell, Stockholm. 1957. pp. 151 + 6 plates. 38 refs. [E.] Price $8. O.R.S.

The main part of the work consists of illustrations (drawings, photomicrographs and electron micrographs) with descriptive notes; the text will be published separately. Pollen of over 50 genera of gymnosperms is illustrated. There is an introduction: On the exine morphology of the saccate pollen grains in recent gymnosperms; and supplements: On new methods in physical cell research and their application in studies of pollen grains and spores (*B. M. Afzelius*), and On the cutting of ultra-thin sections (*J. R. Praglowski*).

4162. HOSNER, J. F. **Multi-seeded acorns.** *J. For.* 57 (2), 1959 (127). 3 refs.

Observations of nursery-grown and natural seedlings of *Quercus falcata* var. *pagodaefolia*, *Q. shumardii* var. *shumardii*, *Q. rubra* and *Q. velutina* indicated that 1–2% of the acorns were multi-seeded. None were noted in *Q. palustris*.

4163. GROSE, R. J., and ZIMMER, W. J. **A description of the seeds of 70 Victorian Eucalypts (illustrated).** *Bull. For. Comm. Vict.* No. 8, 1958. pp. 24 + 26 photos. 6 refs.

When classified according to seed characters, these species form 3 main groups that are closely related to the major anther groups. Except in Section *Macrantherae*, seeds of species within each anther section are alike; and although *Macrantherae* is very heterogeneous, seed characters are uniform within each series of the Section. Species with similar seeds frequently have cotyledons shaped alike, and often belong to the same bark group.

165.3/.7. Heredity, Genetics and Breeding; Variation

See also Nos. 4140, 4157, 4210, 4213–4, 4248–50, 4289, 4293, 4309, 4354, 4407–17, 4425–6, 5095, 5097–8, 5170, 5305, 5320.

4164. ROHMEDER, E., and SCHÖNBACH, H. Genetik und Züchtung der Waldbäume. **[Genetics and breeding of forest trees.]** Paul Parey, Hamburg & Berlin. 1959. pp. 338. Many refs. [G.] Price *DM.* 38.

Covers in 4 sections the aims, basic principles (including general genetics and biology of reproduction) and methods of forest tree breeding, and the breeding of the most important genera, with chapters on techniques (crossing and propagation, progeny testing, lay-out of experiments etc.). Each chapter is followed by an extensive, though not comprehensive bibliography.

4165. **Proceedings of the 5th meeting of the Committee on Forest Tree Breeding in Canada, Petawawa F.E.S. September 19th-20th 1957. Part II. Reports and papers.** Forest Research Division, Forestry Branch, Department of Northern Affairs and National Resources, Ottawa. [1957?] pp. 88.

Progress reports from 16 institutions in Canada and the U.S.A. engaged in tree-breeding. There is also a short paper on "Spruce cone and seed insect problems" (*W. H. Cram*) giving some inconclusive data on chemical control.

4166. BENEA, V., *et al.* Selecţia şi ameliorarea speciilor forestiere din Republica Populară Romîna realizări din 1949-1956. **[Forest tree breeding in Rumania 1949–56.]** [*Publ.*] *Inst. Cerc. silv., Bucureşti* (*Ser. a II-a*) No. 10, 1957. pp. 73. 34 refs. [Rum.russ.g.f.]

Describes methods employed (selection and hybridization) and results obtained, for the genera *Quercus*, *Fraxinus*, *Populus*, *Alnus*, *Juglans* and *Pinus*.

4167. TODA, R., NAKAMURA, K., and SATOO, T. **The heritability of tree height and stem girth in *Cryptomeria* through sexual reproduction.** *Silvae Genet.* 8 (2), 1959 (43–9). 4 refs. [E.e.g.f.]

The heritability, in the narrow sense, of tree height and stem girth, was estimated in *C. japonica*, using as material a 20-year-old progeny trial. Comparing the results with heritability in the broad sense [cf. *F.A.* 20 No. 145], the authors state that the effect of selection by sexual reproduction must be ½ or ⅓ of that of vegetative propagation, and that the importance of heterosis is also confirmed by this study of variation. The changes in variation that accompany the ageing or increase in size of trees are discussed, but no conclusion is reached. *From authors' summary.*

4168. SHIIBA, H., and SUZAKI, T. **[On the native races of *Cryptomeria japonica* D. Don propagated by vegetative means in Kyushu.]** *Rep. Kyushu Univ. For.* No. 11, 1958 (49–60). 34 refs. [Jap.e.]

Lists the races included in a trial area at the Kasuya Instruction Forest, describes the conditions of the trial, and methods. Comparative studies will be made on growth and the effect of fertilizers on growth. *From authors' summary.*

4169. DIMPFLMEIER, R. Die Bastardierung in der Gattung *Larix*. **[Hybridization in the genus *Larix*.]** *Forstwiss. Forsch.* No. 12, 1959. pp. 75. 74 refs. [G.g.]

Briefly reviews the history of hybridization of forest trees, and known hybrids in the genus *Larix*. Describes the stand density, height and diameter increment, form, health and phenology of plots of *L. decidua*, *L. leptolepis* and hybrid Larch (from Scotland), started in 1927 at Gauting, Germany. Discusses also the attempts made by M. Rohmeder in 1940–42 to test the genuineness of the Scottish hybrid Larch by controlled crossing on the Gauting plots, and the complete destruction of the progeny thus obtained, owing to neglect towards the end of and after the war. Until then, the combination *L. leptolepis* ♀ × *L. decidua* was doing best. The results of the Grafrath plot in Gothe's crossing trials [see *F.A.* 18 No. 114] are also discussed. In 1951 the author started his own hybridization experiments, using parents from Gauting and Grafrath [cf. *F.A.* 14 No. 996]. Information is given on the pollinations (21 controlled and 11 open pollinations) and the techniques used, seed production, raising of seedlings (>13,000), planting out (4 different sites), survival, height increment and frost damage, together with some phenological observations. Results indicate that the characteristics and performance of hybrids depend not only on the species of the parents, but also on individual characteristics of the parent trees. The quality and quantity of natural regeneration in stands of hybrid Larch in mixture with the parent species, or even with a different species, show that there is no danger of a substantial decrease in yield in the F_2 generation.

4170. LEIBUNDGUT, H. Untersuchungen über europäische Lärchen verschiedener Herkunft. 2. Mitteilung. Der jährliche Verlauf des Höhenwachstums. **[Investigations on European Larch of various provenances. II. The seasonal rhythm of height growth.]** *Schweiz. Z. Forstw.* 110 (5), 1959 (309–14). [G.f.]

In continuation of a study of 27 (mostly Swiss) provenances on the Uetliberg, Zürich, involving the observation and measurement of ca. 4000 plants, to establish ecotypical differences in phenology, morphology, and growth [cf. H. Leibundgut and R. Kurz, *Mitt. schweiz. Anst. forstl. Versuchsw.* 28, 1952 (408–95)] in which the seasonal development of height growth had proved an important characteristic, a further 11 provenances, viz: 7 Swiss, 3 Polish and 1 Slovak (Tatra) were investigated. While beginning, end, and duration of height growth differed widely, without any clear groupings emerging except that most Swiss types started before the Eastern types, there appeared to be a correlation between altitude and the date when 50% of total height growth was achieved, the provenances from the highest localities reaching this stage earliest. The 4 Eastern provenances had very similar growth patterns, but the Alpine provenances differed widely (24 days for the 50% point) suggesting great differences in ecotypes.

4171. MERGEN, F. **Colchicine-induced polyploidy in Pines.** *J. For.* 57 (3), 1959 (180–90). 26 refs.

Reviews the literature [cf. *F.A.* 15 No. 3265], and describes the author's own work, in which polyploidy was induced by colchicine treatment of (1) *Pinus elliottii* seed and seedlings, (2) *P. elliottii* embryos, and (3) ♂ strobili of *P. taeda*, *P. nigra* and *P. mugo*. The methods, and their effect on the morphology and cytology of the plant material, are described in detail.

4172. BOURDEAU, P. F., and MERGEN, F. **Photosynthesis and respiration in colchicine-induced polyploid seedlings of Slash Pine.** *J. For.* 57(3), 1959 (191–3). 15 refs.

The rates of photosynthesis (r.p.) and of respiration (r.r.) were measured in polyploid *Pinus elliottii* grafted on to diploid stocks. R.p. was significantly lower, and the compensation point (c.p.) higher, in both primary and secondary needles of polyploids than in those of diploids, but r.r. was not affected by polyploidy. The lower r.p. is thought to contribute to the slower growth rate of polyploids. The primary needles of both diploid and polyploid plants were more efficient at low light intensities than secondary needles, and had a lower c.p. *From authors' summary.*

4173. SCHÜTT, P. Züchtung mit Kiefern. Teil II. Kreuzungen, Resistenzzüchtung und Zytologie. **[Pine breeding. Part II. Cross-breeding, resistance breeding, and cytology.]** *Mitt. BundesforschAnst. Forst- u. Holzw.* No. 42, 1959. pp. 40. Many refs. [G.g.]

[Cf. *F.A.* 20 No. 1460.] Covers: natural and artificial interspecific crosses with their special properties, and tables of recorded successful and unsuccessful crosses in the sub-genera *Haploxylon* and *Diploxylon*; intra-specific crosses with special reference to *Pinus sylvestris*, individual crossings and selfings; technical problems (e.g. excised embryos, storage of pollen); resistance against fungi (particularly *Cronartium ribicola*, *Melampsora pinitorqua*, *Lophodermium pinastri* and *Phytophthora cinnamoni*), insects (particularly *Dendroctonus brevicomis*) climatic factors (drought, salt, cold); and cytology, including polyploidy and artificially induced changes.

4174. WRIGHT, J. W., and GABRIEL, W. J. **Possibilities of breeding weevil resistant White Pine strains.** *Sta. Pap. Ntheast. For. Exp. Sta.* No. 115, 1959. pp. 35. 27 refs.

[Cf. *F.A.* 19 No. 3846.] Studies to find 5-needled Pine strains resistant to *Pissodes strobi* were begun in 1952, and examinations made of 10 introduced species in arboreta and plantations, and geographic, local and individual-tree variations in *Pinus strobus*. *P. monticola* was the most promising; in the 10 locations studied it showed good growth rate, bole form and climatic adaptability. It crossed easily with *P. strobus*, and was more resistant than this to weevil, though susceptible to blister rust (*Cronartium ribicola*), and can be recommended for some areas with high weevil populations. The next most promising species (in order), *P. griffithii*, *P. peuce* and *P. ayacahuite*, must be tested further for weevil resistance and ecotypic variation. Conclusions on the selection and breeding of weevil-resistant *P. strobus*, based on a statistical examination of the findings, are very tentative and, on the whole, negative, though the testing of different geographic ecotypes holds some promise. *P. monticola*, alone or in hybrid combination with *P. strobus*, gives the best prospect of a resistant strain adapted to conditions in the North-East.

4175. VIDAKOVIĆ, M. Oblici crnog bora u Jugoslaviji na temelju anatomije iglica. **[Forms of *Pinus nigra* in Jugoslavia on the basis of the anatomical structure of the needles.]** *Glasn. šumske Pokuse* No. 13, 1957 (111–248 + 1 map, 2 tbls., 14 plates). 45 refs. [Serb.e.*e.*]

Five races are distinguished and described in detail and a key provided for identification. Data are given on their distribution.

4176. SCHOENIKE, R. E., RUDOLPH, T. D., and SCHANTZ-HANSEN, T. **Cone characteristics in a Jack Pine seed source plantation.** *Minn. For. Note* No. 76, 1959. pp. 2. 1 ref.

Analyses morphological differences in cones of *Pinus banksiana* of 23 provenances at Cloquet [cf. *F.A.* 14 No. 264]. Differences in length, shape, angle on stem and type (closed or open) were considerable.

4177. RUDOLPH, T. D., SCHOENIKE, R. E., and SCHANTZ-HANSEN, T. **Results of one-parent progeny tests relating to the inheritance of open and closed cones in Jack Pine.** *Minn. For. Note* No. 78, 1959. pp. 2. 3 refs.

In 1939 collections were made of open-pollinated cones from (i) 10 closed-cone and (ii) 18 open-cone trees of *Pinus banksiana* scattered throughout the Cloquet Forest. Surviving progenies were examined in 1957 and classified as (*a*) with all or practically all closed cones, (*b*) with all or practically all open cones, and (*c*) with more or less equal numbers of open and closed cones. Progenies from (i) had (*a*), (*b*) and (*c*) in the ratio 5/1/2, and those from (ii) in the ratio 1/2/1. The genetical implications of these findings are discussed.

4178. HYUN, S. K. **Feasibility of large-scale controlled pollination as a means of mass producing hybrid Pine seed.** From *abstr.* in *Proc. 10th int. Congr. Genet., Montreal* Vol. 2, 1958 (130–1). [E.] C.G.B.

Describes the methods used in Korea, where a 10-year-old *Pinus rigida* plantation covering ca. 5 ha. was pollinated with *P. taeda* pollen imported by air from Placerville, California; some 45,000 matured cones and 2,250,000 seeds of 58% fertility were produced.

4179. BANNISTER, M. H. **Evidence of hybridisation between *Pinus attenuata* and *P. radiata* in New Zealand, and variation in samples of two-year-old *Pinus attenuata*, *P. radiata* and their hybrids.** *Tech. Pap. For. Res. Inst. N.Z. For. Serv.* No. 13, 1958. pp. 20 + 12 photos. 33 refs.

The first article discusses the relationship of the two species, including the likelihood of, and evidence for, introgression of *P. attenuata* into *P. radiata*, and describes putative hybrids found at 5 places. The second article compares the progeny of seed from 3 American provenances of *P. attenuata*, of 1 artificial (Placerville) crossing of the two species and 1 putative hybrid from Canterbury, with each other and with *P. radiata* seedlings from Rotorua. Analyses of hybrid indices, using 7 characters, effectively discriminated the species and placed the hybrid progeny between the two.

4180. BROWN, A. G. **A simple pollen viability test.** *Aust. For.* 22 (1), 1958 (10–2). 6 refs.

A simple method of determining the germination of Pine pollen is described. It consists of dusting the pollen to be tested on a slide which is placed over water in a Petri dish, which is kept at about 25° C. for 72 hours. The use of cotton blue stain applied at the time of examination is of assistance in counting the germinated grains, especially when they are viewed in reflected light. *Author's summary.*

4181. MCWILLIAM, J. R. **Effect of temperature on pollen germination of *Pinus* and its bearing on controlled pollination.** *For. Sci.* 5 (1), 1959 (10–7). 16 refs.

Temperatures were measured hourly from 9 a.m. to 4 p.m., over 5 sunny days, in the strobili of Austrian and Slash Pine: (*a*) in sausage-casing bags; (*b*) as for (*a*) plus a brown kraft-paper bag with ventilation holes as an outer cover; (*c*) as for (*a*) but with the upper ¾ lightly sprayed with aluminium paint; (*d*) no cover, in direct sun; (*e*) no cover, in shade. The mean temperatures (graphed) for all hours fall from (*a*) to (*e*). Lethal temperatures for germinating pollen, i.e. >46° C. occurred in (*a*), while those of (*c*) were close to those of uncovered strobili (*d*). The germination and tube growth of Austrian Pine pollen was studied (1) under various constant temperatures and (2) under various constant temperatures for 8 and one constant temperature (26° C.) for 16 hours of the day. Under (1) germination and tube growth took place between 16 and 42°, optimum 30–32°. Under alternating temperatures (2) the lower range is greatly extended. Pollen germinated freely when given 8 hours at 0° alternating with 16 hours at 26°, unless the low temperature was imposed during imbibition, in which case germination was completely inhibited.

4182. Ching, K. K., and Ching, T. M. **Extracting Douglas-Fir pollen and effects of gibberellic acid on its germination.** *For. Sci.* 5 (1), 1959 (74–80). 7 refs.

[Cf. *F.A.* 18 No. 2503.] Pollen was extracted from replicated groups of branches, each bearing 100 just emerging cones, set in the laboratory at the following ° F. and % r.h.: (*a*) 88–90°, 90%, (*b*) 90°, 44%, (*c*) 36°, 85–90%, (*d*) (standard) 70°, 66%, (*e*) pre-chilled 33 hours at 35°, extracted at 70° and 44%. Total production was greatest in (*d*) and least in (*e*). In all treatments (except the cold wet, (*c*), which produced no pollen in 4 days), almost 90% of the pollen was produced in the first and second days. The hot/dry treatment (*b*) had the fastest rate of germination in pollen collected after 10 and 22 hours, the hot/wet (*a*) the slowest. The K salt of gibberellic acid at 10, 100, and 1000 p.p.m. caused significantly more tube growth and more advanced cytological development than in the controls. Spraying receptive ♀ cones with this compound in open and controlled pollination is suggested.

4183. Hutchinson, A. H. **The principles involved in polygenic selection from a polyzygous population of Douglas Fir.** *Abstr.* in *Proc. 10th int. Congr. Genet., Montreal* Vol. 2, 1958 (129). [E.] C.G.B.

A genotypic evaluation of wind-pollinated Douglas Fir populations is premised on polygenic segregation involving various growth rates, frost sensitivity, and cyclic bud activity. In each case 3 or 4 allelic factors are required to satisfy the polyzygous states, which are evident from more than 80,000 readings. Simple equations in terms of N, the number of polygenic alleles, and n, the degree of parental heterozygosity, relate the phenotypes and genotypes of the progenitors to the class frequency distribution coefficients of the progenies $(1 + 1)^n \times 2^{2N-n}$. All population curves are reduced to the common base, 2^{2N}. Each controlled biparental class-frequency polygon of a specific polyzygous population is balanced and includes $(n + 1)$ phenotypic classes from a possible $(2N + 1)$ classes, each of which belongs to one of (factorial $(N + 1)$) effective genotypic classes. These genotypes may combine to produce factorial $2N + 1$ class frequency series, as progenies. Wind-pollinated, multiparental stocks are characterized by class frequency polygons that show predictable skewness, multiple peaks and extended plateaus. Selection may be controlled genotypically on these bases. Examples of natural selection are presented.

4184. Holmgren, A. Några anmärkningsvärda tall- och granformer. **[Some peculiar forms of Scots Pine and Norway Spruce.]** *Svenska Skogsv-Fören. Tidskr.* 57 (1), 1959 (9–42). 18 refs. [Sw.]

Trees described include a Pine with a bushy habit and another with corkscrew stems, the latter type forming a whole stand near Uppsala, and two forms of Spruce, an '*acrocona*' form, with cone-like deformations on terminal shoots, and a 'dichotype' form having an upper crown of very short and a lower crown of long branches.

4185. Boerner, F. 'Rückmutation' an *Picea abies* (L.) Karst. var. *virgata* Th. Fries. **[Backmutation in *P. a.* var. *virgata*.]** *Mitt. dtsch. dendrol. Ges.* No. 59, 1955/1956 (93–6). 3 refs. [G.]

Describes the variety, and 5 cases of backmutation on branches of a specimen in the Kurpark at Bad Wildungen.

4186. Minckler, L. S., and Ryker, R. A. **Color, form, and growth variations in Eastern Redcedar.** *J. For.* 57 (5), 1959 (347–9).

In 1951, 2-year-old seedlings from eight geographical sources of *Juniperus virginiana* were planted in randomized plots (100–400 trees/plot) within replicated blocks on an old field site in S. Illinois. Six years later significant variations in winter foliage colour, crown form, growth rate, survival, leaf form, and resistance to Cedar-apple rust were noted. The progeny of some large trees in the Lebanon Forest, Wilson County, N. central Tennessee, were the largest, the greenest in winter, showed 92% survival after six years, had broadly conical crowns with mostly scale-like leaves, were vigorous, and had good characteristics for Christmas trees, lumber, and posts.

4187. Ljunger, Å. Al- och alförädling. **[Alder and Alder breeding.]** *Skogen* 46 (5), 1959 (115–7). 3 refs. [Sw.]

Discusses the two species found in Sweden, their ecology and silvicultural importance and the occurrence of hybrids, and presents figures from breeding experiments showing in graphs the superior height growth of *A. rubra* × *A. glutinosa* compared with *A. glutinosa* during the first 7 years and probable future developments, concluding that the hybrid will reach a height of 20 m. at 22–24 years and *A. glutinosa* at 40.

4188. Silliman, F. E., and Leisner, R. S. **An analysis of a colony of hybrid Oaks.** *Amer. J. Bot.* 45 (10), 1958 (730–6). 16 refs. O.B.D.

A study (with particular reference to leaf characters) of a hybrid swarm growing in a disturbed habitat in the Piedmont of N. Carolina. The population consists primarily of *Quercus* × *saulii* (*Q. alba* × *Q. prinus*). *From authors' summary.*

4189. Cram, W. H. **Two recessive characters of *Caragana arborescens*.** *Repr.* from *Proceedings of the Genetics Society of Canada* 3 (2), 1958 (47–9). 4 refs.

Presents tabulated results of segregations into green or yellow seedlings and erect or drooping growth habit of 3 F_1 progenies.

4190. Ragonese, A. E., and Rial Alberti, F. Sauces híbridos originados naturalmente en la República Argentina. **[Hybrid Willows occurring spontaneously in Argentina.]** *Revista de Investigaciones Agrícolas, Buenos Aires* 12 (2), 1958 (111–53 + 22 plates + 1 tbl.). 10 refs. [Span.]

A single species and one variety only of *Salix* are native to Argentina, viz. *S. humboldtiana* and *S. humboldtiana* var. *martiana*, though *S. babylonica* has long been cultivated in the country. Other species introduced into the Paraná Delta at the beginning of this century are ♀ *S. alba* var. *calva*, ♀ *S. alba* var. *vitellina*, ♀ *S. fragilis*, ♀ *S. viminalis*, ♂ *S. caprea* and an unidentified Willow named Mackoy [Mackay?]. In recent years the unsatisfactory development of *S. alba* var. *calva* has led to the investigation of Willows naturally occurring in the region. They are of uncertain origin, but probably result from crosses between ♂ *S. humboldtiana* and ♀ *S. babylonica*. These hybrids are grouped under the general name *S.* × *argentinensis* with a native name to distinguish each cultivar, e.g. *S. argentinensis* cv. 'Mestizo Pereyra'. The morphology and phenology of 8 of these are described.

4191. Hunziker, J. H. Estudios citogenéticos en *Salix humboldtiana* y en sauces híbridos triploides cultivados en la Argentina. **[Cytogenetic studies of *S. humboldtiana* and triploid hybrid Willows cultivated in Argentina.]** *Revista de Investigaciones Agrícolas, Buenos Aires* 12 (2), 1958 (155–71). 29 refs. [Span.e.]

Cytological investigations are reported on 3 hybrid clones from the Paraná Delta, and one possible parent, *S. humboldtiana*. Meiotic irregularity observed in the clones, and especially the high number of univalents, confirm their hybrid origin. The fact that they are triploid supports the hypothesis that they are natural hybrids of indigenous *S. humboldtiana* and one of the cultivated tetraploids, *S. alba* var. *calva* and *S. babylonica*. The external and internal causes of the meiotic irregularities, and of the consequent formation of non-reduced and fertile pollen grains are discussed.

4192. Eifler, I. Beschreibung einer Fixiermethode die das Auszählen von Birkenchromosomen erleichtert. **[A fixation method simplifying the counting of Birch chromosomes.]** *Züchter* 29 (1), 1959 (57–9). 9 refs. [G.] E.M.B.

The method involves preliminary fixation of the material with alcohol/glacial CH_3COOH (*a*), followed by treatment with a solution of oxyquinoline (*b*) with aesculin added to it. Photomicrographs are given showing the comparative results obtained with squash preparations from roots and leaves of *Betula verrucosa* × *B. pubescens*, prepared by (1) the new method, (2) fixing with (*a*) alone, and (3) preliminary fixing with (*a*) followed by treatment with (*b*). [Cf. *F.A.* 14 No. 3056.]

4193. Hunziker, J. H. **Karyotype analysis in *Cupressus* and *Libocedrus*.** *Abstr.* in *Proc. 10th int. Congr. Genet., Montreal* Vol. 2, 1958 (128–9). [E.] C.G.B.

Presents a study of the nuclei of 8 species and varieties of *Cupressus* and one species of *Libocedrus*. [Cf. *F.A.* 18 No. 2509.]

168. Histology

See also Nos. 4298, 5087 *et seq.*

4194. Bluket, N. A. Pričiny zameny ėpidermisa probkoj u derev′ev i kustarnikov v period krahmalistogo minimuma. **[The reasons for the replacement of epidermis by cork in trees and shrubs during the period when their starch content is lowest.]** *Izv. Timirjazev. sel′.-hoz. Akad.* No. 1, 1959 (48–58). 25 refs. [Russ.russ.e.] O.R.E.

Discusses Russian, German and French theories on the causes of the phenomenon. Observations were made on the date of origin of the phellogen, phelloderm and the first cork cells, and on the place where the phellogen originated, on 27 tree and shrub species in the Moscow region. The species included *Robinia pseudoacacia*, *Quercus robur*, *Ulmus laevis*, *Tilia cordata*, *Acer platanoides*, *A. negundo*, and *Phellodendron amurense*. The phellogen began to develop in the shoots in June in the first year, and the author considers this to be due to the sharp increase then in air temperature, moisture deficit and sunshine, which sets up a defence mechanism (cork formation) in the plant to reduce water losses.

4195. Štromberg, A. Ja. Dejatel′nost′ kambija v list′jah nekotoryh drevesnyh dvudol′nyh rastenij. **[Cambial activity in leaves of some woody dicotyledonous species.]** *Dokl. Akad. Nauk SSSR* 124 (3), 1959 (699–702). 7 refs. [Russ.] A.P.B.

In the 5 deciduous species examined, cambial activity in the vascular system of leaves was either absent (*Betula chinensis*, *Fagus orientalis*, *Celtis caucasica*) or very limited (*Vitis vinifera*, *Ulmus glabra*). The leaves of evergreens (*Ligustrum vulgare*, *Prunus laurocerasus*, *Viburnum rhytidophyllum*, *Ilex aquifolium*, *Euonymus japonicus*) all displayed cambial activity in the first year, and sometimes in the second, of their life.

17. Systematic Botany

See also No. 4161.

172.1/173.5. Cryptogams

See No. 4317.

172.8. Eumycetes (True Fungi)

See Nos. 4132, 4764 *et seq.*, 5259 *et seq.*

174. Spermatophyta, Seed-Plants in General. Floras and Check-Lists

4196. Meikle, R. D. **British trees and shrubs.** Eyre and Spottiswood, London. 1958. pp. 244 + 15 plates. 13 refs. Price 25*s*.

Includes a key to genera and illustrated descriptions of species.

4197. Gurney, R. **Trees of Britain.** Faber & Faber, London. 1958. pp. 228 + 16 plates. 86 refs. Price 30*s*. O.R.E.

Describes and illustrates ca. 115 native and introduced trees and shrubs.

4198. Mayer, E. Pregled spontane dendroflore Slovenije. **[A review of the native woody flora of**

Slovenia.] *Gozd. Vestn.* 16 (6/7), 1958 (161–91). 51 refs. [Sloven.g.]

Besides the native woody species, deals with the cultivated and introduced species that have acclimatized themselves in Slovenia. The species are listed systematically (154 genera) with notes on nomenclature, and a glossary of Slovenian generic names with their scientific equivalents.

4199. REGE, N. D., DEVARAJ, S. Y., and NAIR, P. K. **Botanical survey of the Nilgiris with special reference to the Central Soil Conservation Research Farm (Ree's Corner), Ootacamund (S.I.).** *Indian For.* 85 (5), 1959 (287–93 + 6 photos, 1 map, 1 dgm.). 5 refs.

4200. **A.E.T.F.A.T.-index 1958: index of the papers on systematic phanerogamy and of the new taxa concerning Africa south of the Sahara and Madagascar.** Association pour l'Étude Taxonomique de la Flore d'Afrique Tropicale, Brussels. 1959. pp. 65. [F.E.] [Cf. *F.A.* 20 No. 168.]

4201. HUBBARD, C. E., and MILNE-REDHEAD, E. [Editors.] **Flora of tropical East Africa. Leguminosae. Subfamily Mimosoideae.** Crown Agents for Oversea Governments and Administrations, London. 1959. pp. 173. Price 12*s*.

Includes the genera *Parkia*, *Entada*, *Elephantorrhiza*, *Piptadeniastrum*, *Newtonia*, *Pseudoprosopis*, *Xylia*, *Adenanthera*, *Tetrapleura*, *Amblygonocarpus*, *Prosopis*, *Dichrostachys*, *Mimosa*, *Leucaena*, *Acacia*, *Albizzia*, *Pithecellobium* and *Cathormion*.

4202. MCVAUGH, R. **Flora of Peru [Myrtaceae].** *Botanical Series, Field Museum of Natural History, Chicago* 13 (Part IV, No. 2), 1958 (569–818). [Cf. *F.A.* 18 No. 2522.]

4203. KOSTERMANS, A. J. G. H. **New and critical Malaysian plants. V.** *Gdns'. Bull.* 17 (1), 1958 (1–10).

[Cf. *F.A.* 18 Nos. 3746–7.] *Brownlowia purseglovei*, *Alseodaphne magnifica*, *Teijsmanniodendron sinclairii*, and *Abarema nediana* spp. nov. are described. *Sympetalandra bornensis* Stapf. is identified with *Erythrophleum densiflorum* (Elm.) Merr., *E. unijugum* Airy-Shaw, and *Serianthes gigalobium* Kostermans.

4204. COCKAYNE, L., and TURNER, E. P. **The trees of New Zealand.** *Inform. Ser. N.Z. For. Serv.* No. 12 (4th ed. rev.) 1958. pp. 182.

A revised edition of a book first published in 1928. In addition to the main section giving botanical descriptions and photographs of tree species, there are short sections (*a*) describing forest types and (*b*) giving brief accounts of the principal timbers.

174.2/.7. Gymnosperms

See also Nos. 4124, 4175, 4179, 4232.

4205. LI, H.-L. **A horticultural and botanical history of *Ginkgo* [*biloba*].** *Morris Arboretum Bulletin, Philadelphia* 7 (1), 1956 (3–11). 33 refs. L.S.

Discusses the history of its cultivation in ancient China and Japan, its introduction to the rest of the world, botanical research on the species, its geographical origin, and the meaning and derivation of the name Ginkgo.

4206. MELVILLE, R. **Notes on gymnosperm nomenclature.** *Kew Bull.* 1958 (3), 1959 (531–4). Several refs.

(1) States the case for maintaining the names *Abies grandis* and *A. amabilis* in their normally accepted meaning, and rejects Franco's use of *A. excelsior* for the former and *A. grandis* for the latter. (2) *A. faxoniana*, *A. forrestii* and *A. georgei* are treated as varieties of *A. delavayi*. *A. faberi* is regarded as synonymous with *A. delavayi*. (3) *Juniperus coxii* is reduced to a variety under *J. recurva*. (4) *Pinus nigra* is upheld (against *P. clusiana*) as the valid name for Austrian Pine; the combination *P. nigra* var. *calabrica* was not validly made, and the correct name for Corsican Pine appears to be *P. n.* var. *maritima* comb. nov.

4207. SELIK, M. *Pinus brutia* in der Türkei. [***P. brutia* in Turkey.**] *Forstwiss. Cbl.* 78 (1/2), 1959 (43–58). 29 refs. [G.g.]

Systematy, morphology (vegetative and reproductive organs), seedlings, and investigations on germination, growth form and varieties, and distribution. The author holds *P. brutia* to be a distinct species, not a variety of *P. halepensis*.

4208. CEBALLOS Y FERNANDEZ DE CORDOBA, L. Ayer y hoy de la sistemática de las Gimnospermas. El tejo ha sido expulsado de las Coníferas. [**Yesterday and today in the systematy of the Gymnosperms. Yew has been excluded from the Coniferae.**] *Montes, Madrid* 15 (86), 1959 (137–44). 6 refs. [Span.]

A brief review of advances in the systematy of the Gymnosperms since the publication of D. Máximo Laguna's Flora Forestal in 1883, with particular reference to the place of the Taxaceae.

175. Angiosperms

4209. HUTCHINSON, J. **The families of flowering plants. Volume I, Dicotyledons. Volume II Monocotyledons.** Clarendon Press, Oxford. 2nd ed., 1959. pp. xi + x + 792. Many refs. Price £7 7*s*.

176.1. Dicotyledons

See also Nos. 4129, 4163, 4187–8, 4190–1, 4238, 4309.

4210. KRAHL-URBAN, J. Die Eichen. Forstliche Monographie der Traubeneiche und Stieleiche. [**The Oaks. A forestry monograph on *Quercus robur* and *Q. sessiliflora*.**] Paul Parey, Hamburg and Berlin. 1959. pp. 288. 805 refs. [G.]

Covers distribution, history, economic and ecological importance, biology, including races and growth, silviculture and logging. Of the references, classified by countries, 483 are in German.

4211. JONES, E. W. **Biological flora of the British Isles. *Quercus* L.** *J. Ecol.* 47 (1), 1959 (169–222). 4½ pp. of refs.

A monograph on *Q. robur* and *Q. sessiliflora* covering morphology, biology and ecology, and including response to biotic factors and the influence of weather on growth. Notes are given on the naturalized species *Q. borealis* var. *maxima*, *Q. cerris* and *Q. ilex*.

4212. Zycha, H., *et al.* Die Pappel. Anbau, Pflege, Verwertung. **[The Poplar, its planting, tending and utilization.]** Paul Parey, Hamburg & Berlin. 1959. pp. 121. 52 refs. [G.] Price *DM.* 14.

A guide to practice in 7 sections: *H. Zycha*, the general editor, has contributed that on Diseases; *E. Röhrig*, Species and varieties, Sites, Injurious animals (including game and cattle), and Yield; *B. Rettelbach*, Planting and tending; and *W. Knigge*, Properties, Harvesting, and Utilization of the wood.

4213. Müller, R. Altstammsorten der Schwarzpappelbastarde (II h, i, k-m). **['Old stock varieties' of Black Poplar hybrids: II h, i, k-m.]** *Holz-Zbl.* 84 (105; 124; 128), 1958 (1333–4; 1577–8; 1635–6); 85 (50; 62), 1959 (663–4; 822–3). Many refs. [G.]

[Cf. *F.A.* 20 Nos. 196–7.] Further instalments, as follows: (*h*) The 'grandis' Poplar (includes clones distributed as 'carrieriana', 'carrieri' (from England), 'wislizenii' and 'regenerata'). (*i*) The 'gelrica' Poplar. (*k*) The 'Leipzig' Poplar. (*l*) The Bavarian 'Flachslanden' Poplar, considered highly resistant to rust, canker and extremes of temperature, and recommended for cultivation outside Bavaria. (*m*) The 'missouriensis Holland' Poplar, which resembles *P.* × *robusta*; listed by the International Poplar Commission as *P. deltoides* cv. 'missouriensis imp. hollandaise', but considered to be a hybrid, not identical with *P. deltoides* subsp. *missouriensis*.

4214. Schreiner, E. J. **Production of Poplar timber in Europe and its significance and application in the United States.** *Agric. Handb. U.S. Dep. Agric.* No. 150, 1959. pp. 124.

Describes in some detail species commonly grown, breeding and selection, nursery practice, site and soil requirements, planting, management, protection, growth and yield, and properties and utilization of wood.

4215. Applequist, M. B. **A selected bibliography on Cottonwood [*Populus deltoides*].** *LSU For. Notes La. agric. Exp. Sta.* No. 24, 1959. pp. 3. 35 refs.

U.S. literature, chiefly from 1940.

4216. Ḥe[d]jazi, R., *et al.* **[Study on a Poplar tree in Iran (*Populus nigra* var. *pyramidalis* Roz.).]** *Bulletin, Forestry & Wood Technology Laboratory, University of Teheran* No. 12, 1957. pp. 72. 13 refs. [Per.e.*e*.] P.R.

[Cf. *F.A.* 17 No. 180.] Despite its Persian name (*Tabrīzī*), the place and time of introduction of this species are unknown. All known specimens are ♀. It is widely planted and lives to ca. 60 years of age, and has many uses, which are detailed. The study, based on an 18-m. tree of 23·5 cm. diam. in Karaj (1320 m. alt.), includes leaf and bud morphology (with photographs, comparing other Poplar species in Persia), histology (microphotographs, lengths of fibres and of other elements), physical and mechanical properties (tabulated), chief methods of propagation (with results of laboratory trials showing that cuttings ca. 25 cm. long are better than the 1–1·5 m. cuttings often used), growth data from 29 trees all 7 years old (height, diam. and volume m.a.i.) and chief local pests (5 beetle, 4 aphid and 2 coccid) with their scientific names. Faulty selection, preparation, planting and tending of cuttings are widespread and greatly reduce the value of the tree to Persia. Cuttings are more prone to disease than transplanted rooted cuttings.

4217. Jafri, S. M. H. **A note on the taxonomy and distribution of some species of *Cadaba*.** *Pakistan J. For.* 8 (2), 1958 (204–5).

Two species occur in the sub-continent of India—*Cadaba fruticosa* is widely distributed, while *C. heterotricha* is known only from Cape Monze near Karachi.

4218. Tisserant, C., and Sillans, R. Matériaux pour la flore de l'Oubangui-Chari (Annonacées). **[Material for a flora of Ubangi-Shari (Annonaceae).]** *Notul. syst., Paris* 15 (3), 1958 (321–54). [F.] O.B.D.

Notes on species of *Monodora*, *Isolona*, *Uvariopsis*, *Piptostigma*, *Artabotrys*, *Hexalobus*, *Enneastemon*, *Uvaria*, *Cleistopholis*, *Annona*, *Anonidium*, *Uvariastrum*, *Xylopia*, *Neostenanthera*, *Popowia*, *Oxymitra* and *Polyalthia*.

4219. Brenan, J. P. M. **Notes on Mimosoideae: V-VII.** *Kew Bull.* 1958 (3), 1959 (407–13).

(V) *Acacia leucospira* sp. nov., a 1-m. flat-topped bush from Somalia. (VI) Further evidence is adduced for the reduction of *A. heteracantha* and *A. litakunensis* to synonymy under *A. tortilis* subsp. *heteracantha* [cf. *F.A.* 19 No. 141]. (VII) *A. ancistroclada* sp. nov., a shrub or small tree from Kenya and Tanganyika.

4220. Dwyer, J. D. **The New World species of *Cynometra*.** *Ann. Mo. bot. Gdn.* 45 (4), 1958 (313–45). 14 refs. O.B.D.

A systematic study, including descriptions of 3 new species, 4 new varieties and 1 new combination.

4221. Noamesi, G. K. **A revision of the Xylocarpeae (Meliaceae).** *Abstr. of thesis*, in *Dissert. Abstr.* 19 (7), 1959 (1531). O.R.S.

Ca. 1,800 herbarium specimens from 39 herbaria were studied. Two genera, *Carapa* and *Xylocarpus*, with 7 and 3 species respectively, are recognized. *Carapa* is grouped into two series, I *Pentamerae* and II *Tetramerae*. Keys to subfamilies, tribes, genera, series and species are followed by detailed descriptions, lists of synonyms and specimens examined, and discussions of ecology, geographic distribution (supplemented by maps), economic uses and native names.

4222. Leroy, J. F. Recherches sur les Meliaceae: sur un genre africano-malgache, le *Lepidotrichilia* (Harms) J. F. Ler. **[Studies on the Meliaceae: an African/Madagascar genus, *Lepidotrichilia*.]** *C.R. Acad. Sci., Paris* 247 (14), 1958 (1025–7). [F.f.] O.R.S.

Distinguishes the genus from *Ekebergia* and

Trichilia, and describes briefly and discusses the distribution of *L. convallariaeodora*, *L. ambrensis* and *L. sambiranensis* spp. nov. and *L. volkensii.*

4223. Leroy, J. F. Sur une petite famille de Sapindales propre à l'Afrique australe et à Madagascar: les Ptaeroxylaceae. [**The Ptaeroxylaceae—a small family of Sapindales indigenous to southern Africa and Madagascar.**] *C.R. Acad. Sci., Paris* 248 (7), 1959 (1001–3). [F.] O.R.S.

Gives taxonomic descriptions of the family and of the two genera *Ptaeroxylon* and *Cedrelopsis.*

4224. Verdcourt, B. **Moringa—a correction.** *Kew Bull.* 1958 (3), 1959 (384–6). Several refs.

The tree erroneously recorded from Kenya and Uganda as *M. peregrina* is identified as *M. stenopetala.* A key to the species of *Moringa* occurring in Kenya is appended.

4225. Sinclair, J. **Florae malesianae precursores—XX. The genus *Gymnocranthera* (Myristicaceae) in Malaysia.** *Gdns'. Bull.* 17 (1), 1958 (96–120).

4226. Aramburu, R. Afinidad de las especies de *Eucalyptus.* [**Affinities of *Eucalyptus* spp.**] *Rev. for. argent.* 3 (1), 1959 (12–7). [Span.]

Presents a table of affinities of 135 species, based not only on botanical characters but also on climatic requirements, and characteristics and uses of the wood.

4227. Petit, E. Les *Gaertnera* Lam. (Rubiaceae) de l'Afrique tropicale et spécialement du Congo Belge. [**The *Gaertnera* of tropical Africa, and, particularly, of the Belgian Congo.**] *Bull. Jard. bot. Brux.* 29 (1), 1959 (37–53). [F.] O.B.D.

A taxonomic review presenting some new species and combinations.

4228. Tisserant, C. Matériaux pour la flore de l'Oubangui-Chari (Samydacées). [**Material for a flora of Ubangi-Shari (Samydaceae).**] *Notul. syst., Paris* 15 (3), 1958 (300–5). [F.] O.B.D.

Notes on 5 species of *Homalium*, *Byrsanthus brownii* and *Casearia barteri.*

4229. Fernandes, A., and Diniz, M. A. Contribuição para o conhecimento das Samydaceae de Angola. [**The Samydaceae of Angola.**] *Garcia de Orta, Lisboa* 6 (3), 1958 (457–64 + 8 plates). [Port.f.e.]

The Samydaceae are represented in Angola by the genera *Casearia* and *Homalium*; 2 species of *Casearia* and 7 of *Homalium* are described.

4230. Robyns, W. Le genre *Afrostyrax* Perk. et Gilg au Congo Belge. [**The genus *Afrostyrax* in the Belgian Congo.**] *Bull. Soc. Bot. Belg.* 91 (1), 1958 (93–8). [F.] O.B.D.

Describes and discusses the taxonomy of *A. kamerunensis* and *A. lepidophyllus.*

4231. Raizada, M. B., and Sahni, K. C. **A new *Symplocos* [*S. changapae*] from Nicobars.** *Indian For.* 85 (3), 1959 (190 + 1 photo, 1 set of drawings).

18. Plant Ecology

181. Mode of Life, Autecology. Silvicultural Characters of Trees

See also Nos. 4207, 4210–6, 4390, 4394, 5383.

4232. Mejorada, N. S., and Huguet, L. **Conifers of Mexico.** *Unasylva* 13 (1), 1959 (24–35). 22 refs.

Briefly describes ecology, silviculture, and utilization, with particular reference to climatic requirements and indications of regions where different groups of Mexican Pines might be introduced.

4233. Bay, E. Sul pino cembro nel distretto forestale di Bolzano. [***Pinus cembra* in the Bolzano Forest District.**] *Monti e Boschi* 10 (1), 1959 (19–24). [It.]

Discusses the ecology of the species, which occurs in both pure and mixed stands covering considerable areas.

4234. Anić, M. Crni bor u sjevernom Velebit. [***Pinus nigra* in the northern Velebit [Croatia].**] *Glasn. šumske Pokuse* No. 13, 1957 (461–507 + 15 plates). 25 refs. [Croat.e.*e.*]

Presents data from studies on the habitat, ecology, biology and silvicultural treatment of *P. nigra*, which is indigenous to this region.

4235. Said, M. ***Pinus gerardiana* (Chilgoza) in the Zhob district (Quetta/Kalat Circle).** *Pakistan J. For.* 9 (2), 1959 (118–23).

Notes on silvicultural characters and ecology of this species, which is highly valued for its edible seeds.

4236. Wenger, K. F. **Silvical characteristics of Loblolly Pine.** *Sta. Pap. Stheast. For. Exp. Sta.* No. 98, 1958. pp. 32. 154 refs.

4237. [**Douglas Fir.**] *Allg. Forstzeitschr.* 14 (8), 1959 (145–83). Many refs. [G.]

A special number, including articles on: Provenance trials in Germany, Netherlands and Denmark (*R. Schober*); Site factors affecting height growth of the green Douglas Fir, and its suitability for different German growth regions (*S. Jahn*) [based on ca. 600 trial plots]; Dutch experiences with Douglas Fir (*J. v. Soest*); 'Douglas Fir and its wood' (*Groos*) [a review of the book by *K. Göhre*]; the state of and outlook for Douglas Fir breeding (*H. J. Fröhlich*); Fibre orientation in the stem of Douglas Fir (*J. P. Vité* and *W. H. Hendrickson*); Transplanting Douglas Fir in semi-shaded nurseries (*Zeyher*); Experiences with peat pots in the transplanting and planting out of Douglas Fir (*L. Hofmann*); Die-back not previously observed in 40- to 50-year Douglas Fir caused by *Phomopsis pseudotsugae* (*H. J. Braun*); and a bibliography from German periodicals of 1952–1958 (32 items).

4238. Svoboda, P. Lesní dřeviny a jejich porosty. Část II. [**Forest trees and their silvicultural characters. Pt. II.**] *Lesn. Knihovna* (*velká Řada*) No. 12, 1955. pp. 573. Many refs. [Cz.] Price *Kčs.* 62.

Defends the lay-out, nomenclature and treatment used in Part I [cf. *F.A.* 15 No. 3325], which are followed here. The species covered are *Quercus robur*, *Fagus sylvatica*, *F. orientalis*, *Carpinus betulus*, *Ostrya carpinifolia*, *Fraxinus excelsior*, *F. ornus*, *Tilia cordata* and *T. platyphyllos*, *T. tomentosa*, *Acer platanoides*, *A. pseudoplatanus*, *A. campestre*, *A. tataricum*, *Ulmus* '*campestris*', *U. laevis*, *Castanea sativa*, and *Juglans regia*.

4239. Ær. [***Acer pseudoplatanus*.**] Dansk Skovforening, Copenhagen. 1958. pp. 210. 71 refs. [Dan.e.*e*.] Price 15*s*.

Comprises the following sections: (I) Natural history, increment and felling (*V. Kjølby*; pp. 5–126) [notes on nomenclature, taxonomic description, natural and cultivated range, a review of literature from Danish, German, English and other languages, figures based on Danish and English data for form factor, site class, thinning grades, volume and b.a., thinning and increment, and comparison with quality classes of other species, climatic and site requirements, occurrence and history in Denmark, historical and current silvicultural treatment, pests and diseases, and some comparative data for other *Acer* spp.; includes also graphs showing yield data]; (II) Natural regeneration, selection felling, and group treatment (*A. Sabroe*; pp. 127–65); (III) The properties, treatment [seasoning], and uses of the wood (*P. Moltesen*; pp. 166–210).

4240. FRANCO, J. DO AMARAL. O carvalho negral (subsídios para o seu estudo botânico-florestal). [***Quercus pyrenaica*** **(contribution to a botanical and silvicultural study).**] *Repr.* from *An. Inst. Agron., Lisboa* 22, 1958 (77–237 + 11 photos). 57 refs. [Port.]

Presents data on nomenclature, morphology and geographical distribution, with a detailed study of the forest types in which *Q. pyrenaica* occurs. The silviculture of the tree is briefly described, with some information on natural and artificial regeneration and on current practice in logging, either for fodder production or to give light to ground crops. Some figures for height and diameter increment in various parts of Portugal are included, with notes on the uses and value of the wood and of the fruit for fodder.

4241. INAL, S. Türkiye'de tarih boyunca palamut meşesi (*Quercus aegilops*) ve sağladıgı faydalar. [**The utilization of *Q. aegilops* in the history of Turkey.**] *Istanbul Üniv. Orm. Fak. Derg.* 8*A*(1), 1958 (1–48). 46 refs. [Turk.g.*g*.]

Traces history, extent and distribution of the forests, ownership conditions, tending, regeneration, acorn yields, economic importance, exports etc. [Cf. *F.A.* 16 No. 1771.]

4242. BLÜMKE, S. Beiträge zur Kenntnis der Robinie (*Robinia pseudoacacia* L.). [***R. pseudoacacia*.**] *Mitt. dtsch. dendrol. Ges.* No. 59, 1955/1956, (38–65 + 4 plates). [G.g.]

Discusses phenology, distribution, races, climatic and soil requirements, yield and increment, silvicultural treatment, natural regeneration, planting, damage, etc. It is considered that management as high forest on ca. 50-year rotations should be the aim in future in Germany. The small ratio of crown diameter to d.b.h., rapid growth and the high wood density combine to make Robinia one of the most valuable broadleaved trees for European conditions. It is stated that 312 sources were used in compiling the article but few are cited in full.

4243. MICHELSON, A. Études forestières: *Markhamia lutea* K. Schum. [**Forestry studies: *M. lutea*.**] [*Publ.*] *Com. nat. Kivu* (*n.s.*) No. 9, 1959. pp. 89 + 4 tbls., 1 plate. 2 refs. [F.]

Covers description, distribution, mensuration, growth and enumeration data, ecology, natural and artificial regeneration, stump preparation (6-month seedlings held in transplant lines for 1–2 years, cut back if necessary at transplanting and again at field planting), cuttings (25-cm. pointed stakes driven into the soil), plantation establishment and tending, injuries, timber seasoning, anatomy (illustrated by photomicrographs), physical and mechanical properties and uses of timber.

4244. Monographie du Limba (*Terminalia superba* Engler et Diels). [**Monograph on *T. superba*.**] *Publ. Centre tech. for. trop.* No. 14, 1959. pp. 77. 19 refs. [F.]

Covers nomenclature; botanical, ecological and silvicultural characters; properties, conversion and uses of the wood; and trade.

4245. *Swietenia macrophylla* King, caractères silvicoles et méthodes de plantation. [***S. macrophylla*: its silvicultural characters and plantation techniques.**] *Bois For. Trop.* No. 65, 1959 (37–42). 16 refs. [F.]

4246. ARMOUR, R. P. **Investigations on *Simarouba glauca* DC. in El Salvador.** *Econ. Bot.* 13 (1), 1959 (41–66). 27 refs.

[Cf. *F.A.* 15 No. 1710.] Covers description and distribution; uses (including match manufacture); oil yield and composition, residual cake; planting methods and costs; production; soils and climate; natural stands; floral type and other varieties; propagation by grafts, cuttings and layers; selection for high yield and special sites; pests and diseases; and a toxin in the cake.

181.1. Distribution, Natural Range

4247. SOMORA, J. O rozšírení niektorých lesných drevín v skupine Lomnického štítu. [**The distribution of some tree species in the forests of the Lomnice peak [Tatra National Park].**] Vydavatel'stvo Osveta, n.p., Martin. 1958. pp. 152 + 10 plates. 97 refs. [Slovak.russ.g.] Price *Kčs*. 14.20.

Briefly describes site, climate and forest types, and then, individually, the distribution of 43 tree and shrub species, giving soil type, forest type, aspect, location, altitude, etc. [The essential information is also given in the 9-page Russian and German summaries.] The most important species are *Picea abies* (76%) and *Larix decidua* (13%), with *Pinus mugo*, *P. cembra*, *P. sylvestris*, *Abies alba*, etc.

4248. MÁLEK, J. Přirozené rozšíření smrku na Českomoravské vysočině. [**The natural distribution of Spruce in the Bohemian-Moravian uplands.**]

Sborn. čsl. Akad. zeměd. (*Lesn.*) 4 (6), 1958 (515–34). 44 refs. [Cz.cz.russ.g.]

The sources are old State archives, some of those consulted dating back to 1590. The distribution is defined, and the author concludes that the original Spruce population of the region is a definite ecotype, distinct from the mountain Spruce.

181.2. Atmospheric Relations. Acclimatization

See also Nos. 4045–8, 4131, 4135, 4140–1, 4143, 4226, 4397, 4409–11, 4471, 4529, 4709 *et seq.*

4249. Wang, C.-W., and Perry, T. O. **The ecotypic variation of dormancy, chilling requirements, and photoperiodic response in *Betula* species.** From *abstr.* in *Proc. 10th int. Congr. Genet., Montreal* Vol. 2, 1958 (307). [E.] C.G.B.

A collection of *B. papyrifera* and *B. lutea*, raised from seed obtained throughout their extensive range, was treated with various combinations of winter chilling and photoperiod in a series of experiments over a 3-year period. The results showed that photoperiod exercised a controlling influence over the continuation of shoot elongation and the onset of dormancy as shown by terminal-bud formation. There was no indication that the time of growth initiation was influenced by photoperiod, except possibly in certain unchilled plants. Breaking of dormancy in certain of these seemed to be hastened by a long-day photoperiod. For most of the plants, winter chilling at 38–40° F. resulted in early and normal breaking of dormancy in spring. But under Florida conditions, plants of extreme northern origin broke dormancy without winter chilling, and almost all the unchilled plants also flushed after various periods of delay, though usually on the basal branches or near the base of the stem, the terminal bud remaining dormant for periods ranging from a few months to a year. Observations of the winter-chilled plants showed that, except for high-altitude plants, the time of the breaking of dormancy and the time of its onset were inversely correlated with the latitude of origin.

4250. Boden, R. W. **Differential frost resistance within one *Eucalyptus* species.** *Aust. J. Sci.* 2 (3), 1958 (84–6). 2 refs. O.R.S.

Seedlings of *E. fastigata* raised in the open in Canberra from seed collected at different altitudes (2350–3850 ft.) on Brown Mountain, N.S.W., showed increasing frost hardiness with increasing altitude of the seed source.

181.3. Water, Soil and Root Relations

181.31. Water Relations

See also Nos. 4056–60, 4141, 4253, 4384, 5306.

4251. Holstener-Jørgensen, H. Undersøgelser af rodsystemer hos eg, bøg og rødgran på grundvandpåvirket morænejord. Med et bidrag til belysning af bevoksningernes vandforbrug. **[Investigations of root systems of Oak, Beech and Norway Spruce on morainic soils affected by groundwater, and a contribution to the elucidation of a stand's water consumption.]** *Forstl. Forsøgsv. Danm.* 25 (3), 1959 (225–89). 24 refs. [Dan.e.]

Three plots were laid out on similar sites in 1955 and measurements continued until 1958. Soil analyses showed that the Beech and Spruce soils were similar in both chemical and physical properties, while the Oak soil differed in its physical properties. Ground-water relationships (highest and lowest levels) were similar for the Beech and Spruce plots but the minimum depth under Oak was considerably more (95 vs. 50 cm.). During the growing season, Oak lowered the water table by 205, Beech by 115 and Spruce by 75 cm. On the last two, the lowering occurred over 3–4 months, and on the Oak plot over 2–6 weeks. Mean annual evapo-transpiration was estimated at 449 mm. for the Oak and Beech plots and 470 mm. for the Spruce, largely as a result of early transpiration during mild weather in late winter. One sample tree from each plot was felled and its root system exposed and measured. The root systems are described with illustrations, and the measurements are given in graphs and tables showing characteristic differences between the species in e.g. root volume, root/top ratio, and root diameters.

4252. Holstener-Jørgensen, H. Skærmstillings og renafdrifts indflydelse på grundvandstanden på leret moræne. **[The effect of shelterwood felling and clear felling on the groundwater of clayey moraine soils.]** *Forstl. Forsøgsv. Danm.* 25 (3), 1958 (291–306). 6 refs. [Dan.e.]

Four plots, all somewhat more than ½ ha. in area, were laid out in a Beech stand aged 65–86 years, in 1956. In Nov. 1956, plot 2 was clear felled and plot 4 had the whole of the lower storey and 28% by b.a. of the upper one removed [stand structure not given]; in spring 1957 they were planted with 2 + 2 Spruce and 2 + 0 Beech respectively. Ground-water measurements, begun in May 1956, will continue as part of a long-term study. Preliminary results after 2 years show that the deepest ground-water level rose by 2 and by 1 m., and the highest stable ground-water level was reached 127 and 81 days earlier on plots 2 and 4 respectively compared with the controls.

181.32/.34. Soil and Nutrient Relations

See also Nos. 4065–71, 4080–6, 4120–2, 4134–5, 4278, 4450–4, 4530, 4561, 4587–8.

4253. Richard, F. Über den Einfluss des Wasser- und Luftgehaltes im Boden auf das Wachstum von Fichtenkeimlingen. **[The influence of water and air content of the soil on the growth of Spruce seedlings.]** *Mitt. schweiz. Anst. forstl. Versuchsw.* 35 (1), 1959 (243–64 + 1 tbl.). 22 refs. [G.e.f.it.]

An investigation, parallel to a previous one [see *F.A.* 20 No. 1549] with a slightly different soil, gave similar results. Raney's O-diffusion chambers for the measurement of air content of the soil yielded a significant correlation between soil aeration and root growth.

4254. Mathieu, T. F. **A study of some characteristics of compacted soils and their effect on the growth of *Tilia cordata*.** *Abstr. of thesis*, in *Dissert. Abstr.* 19 (7), 1959 (1498–9). O.R.S.

In Dec. 1950, 100 plants (⅜- to ¾-in. caliper) were planted in 5 plots and in Oct. 1951 or April 1952 each plot was given one of the following treatments: (1) sodded with a blue-grass sod: (2) mulched with ground corn-cobs; (3), (4) and (5) 1, 2 or 4 in. of soil respectively added and tamped to the original level. If total shoot growth in Oct. 1952 on plot (2) is taken as 100%, the value for (1) was 31% (probably from grass competition), for (3) 81%, and that for both (4) and (5) ca. 62%. Probable factors in the reduced growth on plots (3)-(5) are physical impeding of root growth, lower O value in soil pores, lower total aggregation and porosity, lower relative non-capillary porosity, and limited mineral-salt distribution in the soil layers occupied by the tree roots because of fixation of the salts in the upper compacted soil layer. The effects of compaction on soil density, porosity, aggregation, O and moisture content, temperature etc., are discussed.

4255. Youngberg, C. T. **The influence of soil conditions, following tractor logging, on the growth of planted Douglas-Fir seedlings.** *Proc. Soil Sci. Soc. Amer.* 23 (1), 1959 (76–8). 11 refs.

The growth and survival of 2 + 0 root-pruned Douglas seedlings was studied (*a*) on tractor roads, (*b*) in loose berm material alongside the roads, and (*c*) on undisturbed areas. First-year survival was $>90\%$ in all classes. Height measurements after 1 and 2 growing seasons showed that plants on (*c*) were significantly better than those on (*b*) and (*a*), and those on (*b*) in some cases significantly better than those on (*a*). Soil analysis revealed particularly poor aeration, moisture and N relationships on (*a*).

4256. **Growth of Norway Spruce on mineral soils.** *Rep. Macaulay Inst. Soil Res. 1957/58*, [1959] (45).

Foliage samples and height measurements were taken in 34 stands of 20-year Spruce growing on a wide range of sites in E. Scotland. A strong correlation was found between height growth and foliage N content in quality classes II-IV; foliage P, K, Ca, and Mg contents were not related to height.

4257. Kanwar, J. S. **Mineral nutrition of *Pinus radiata*.** *Indian For.* 85 (4), 1959 (237–40 + 1 photo, 1 gph., 1 dgm.). 8 refs.

In pot experiments conducted with Kangroo Island soil (a gravelly sandy loam), *P. radiata* gave marked responses to the application of N and P, but $(NH_4)_2SO_4$, when used in high doses, lowered the pH of the soil and produced some undesirable results. Pine needles showed discoloration at a certain stage of growth, indicating micronutrient deficiency, but treatment with a micronutrient mixture containing Cr, V, Ni, Co, Cu, Mn, Zn and Mo failed to give any clear indication of a deficiency of any of these elements. The unsuitability of this technique of using mixtures of micronutrients is pointed out and the individual application of these elements is recommended, for the determination of nutrient deficiencies in soil. *From author's summary.*

4258. Fowells, H. A., and Krauss, R. W. **The inorganic nutrition of Loblolly Pine and Virginia Pine with special reference to nitrogen and phosphorus.** *For. Sci.* 5 (1), 1959 (95–112). 36 refs.

Describes a replicated trial of one-year seedlings grown for 50 weeks, on a day-length of 15 hours, in sterile sand, watered with various nutrient solutions hourly. These pioneer species reacted similarly. P was adequate at 1 p.p.m. and both grew best with N at 25–100 p.p.m. Na as high as 250 p.p.m. does not retard development or growth. Deficiency symptoms of N and P are discussed; the presence of mycorrhizae may indicate such a deficiency.

4259. Barnes, R. L., and Naylor, A. W. **Effect of various nitrogen sources on growth of isolated roots of *Pinus serotina*.** *Physiol. Plant., Copenhagen* 12 (1), 1959 (82–9). 16 refs.

Isolated Pond Pine roots (5 per treatment) were grown in sterile culture for 30 days with various amino acids or urea as the sole N source. With citrulline and amino-butyric acid at $10^{-3}M$ concentrations, the summated length growth of all the tips was 119 and 103 mm. respectively, compared with 158 mm. using NO_3, and dichotomous branching, resembling mycorrhiza formation, occurred. Arginine, aspartic acid and ornithine were moderate to poor N sources and produced swollen tips on lateral roots; glutamic acid and proline were not good N sources and did not alter root habit. Urea at $10^{-5}M$ supported good growth (though all cultures died later) and a little dichotomous branching occurred. [Cf. *F.A.* 20 No. 1477.]

4260. Remezov, N. P. O metodike izučenija biologičeskogo krugovorota ėlementov v lesu. **[Methods of studying the biological cycle of elements in the forest.]** *Počvoved.* 1959 (1), (71–9). 35 refs. [Russ.] A.P.B.

Criticizes work by Vinokurov and Tjurmenko [cf. *F.A.* 20 No. 34] based on Tjulin's method of assessing nutrient uptake from soil analyses only, and justifies the method of direct plant analysis, which was used by the Department of Soil Science, Moscow University, to study seasonal changes in the composition of different parts of trees. In 1952, in a 50-year-Oak stand of site class III in the Voronezh reserve, the leaves, branches, stem and roots of trees were analysed 3 times during the growing season (2 trees analysed at each time). The maximum uptake of N, K, Mg and P was found to occur in June. In July, the N and K contents dropped considerably, but the % decrease was much greater in the leaves and branches than in the stem and roots, and the amounts lost from the leaves and branches were about the same as those calculated to be required for the annual wood increment. The Ca content of all organs increased throughout the season. No support was found for the idea that these substances are exuded by the roots into the soil in large quantities but, as a rough test, lateral roots of Oak, Pine and Spruce were dug up and immersed in a vessel containing aerated distilled water or nutrient solution. No exudations were detected in the early summer; in late summer small amounts only of K, Ca, Al and P were exuded. In other investigations on Oak, analyses with particular attention to roots <3 mm. in diam. showed that these contained much more Fe and Al (calculated per ha.) than the annual litter fall, and about half the amount of the Si and K in the litter. As mortality of roots <3 mm. was high (the weight of live roots <3 mm. falling from 0·8 tons/ha. in June/July to 0·5 tons/ha. in August), their death must have a considerable influence on the biological cycle of nutrients.

4261. **Soil properties vary significantly around individual trees and between species.** *Calif. For. & For. Prod. Calif. For. Prod. Lab.* No. 10, 1959 [2].

Studies under individual Shore Pines [*Pinus contorta* var. *contorta*] and Giant Sequoia [*Sequoia gigantea*] showed significant variation of such soil properties as acidity and N content. Round Shore Pine, pH increased with radial distance from 4·5 directly under the tree to 7·5 in the open. Exchangeable cations also increased, but N content decreased, with distance from the stem. Under old Sequoia trees, the degree of base saturation was moderate near the stem, base-saturated soil occurred 10 ft. from the stem, and the degree of base saturation declined with further increase in distance. N content showed similar trends, with the maximum occurring under the crown, where it equalled that of the richest agricultural soils. The pH was neutral (7·1) under leaf litter but more acid near the stem (6·8) and in the open (6·6). Root content of soil was greatest at a distance of 10–20 ft. from the tree. Bulk density of the surface soil showed a similar pattern of variation, with low values (0·35–0·68) under leaf litter ca. 10 ft. from the tree, and higher values against the stem (0·42–1·02) and on the adjacent opening (0·78–0·94). Long-term site occupancy by *S. gigantea* thus appears to develop a soil of high fertility, good base status, and low density, with no evidence of site deterioration. N content of mineral soils (measured to a depth of 48 in.) showed significant variation with tree species—from 1954 to 12,900 lb./acre—being lowest under Ponderosa Pine, followed in increasing order by Douglas Fir and Incense Cedar.

4262. **Investigations into the influence of Eucalypts on the underlying soil in the Coleraine area.** *Ninth Annual Report, Victoria Soil Conservation Authority, Melbourne 1957/58*, 1958 (31).

It has been noted that introduced herbage species, such as perennial ryegrass and clovers, often flourish under Red Gum [*Eucalyptus rostrata*?], but nowhere else in unimproved pasture on the table-land soils near Coleraine. Analysis of soil samples taken from under these and Manna Gums [*E. viminalis*] indicated the accumulation of a number of elements under the influence of these Eucalypts. Further studies are in progress.

4263. PEARMAN, P. J. **The influence of heather (*Calluna vulgaris L.*) on root growth in tree seedlings.** *J. Oxf. Univ. For. Soc.* (*Ser. 5*) No. 7, 1959 (28–33). 5 refs.

The reaction of the rooting medium has a marked effect on root growth of Sitka Spruce seedlings, with an optimum around pH 5. The acid nature of heathland soils and aqueous leachates from *Calluna* plants and humus suggests that pH may be an important factor directly influencing growth in the field. Preliminary experiments with Scots Pine seedlings indicated a marked depressing effect on root growth of *Calluna* plant and humus leachates, independent of the pH. Experiments with Sitka Spruce seedlings suggest that this "toxic" effect disappears with adequate aeration; this has the effect of rapidly oxidizing the highly reduced substrate formed under inadequate aeration. *From author's summary.*

181.35. Special Modes of Nutrition. Symbiotic Relationships. Parasitism

See also Nos. 4084, 4135, 4258, 4515, 4519, 4708.

4264. HARLEY, J. L. **The biology of mycorrhiza.** Leonard Hill [Books] Limited, London. 1959. pp. xiv + 233 + 11 plates. 18 pp. of refs. Price £2 15*s.*

Collects and summarizes existing information and emphasizes outstanding problems. Part I gives a brief survey of the ecology of soil fungi; ecological classifications of soil fungi are considered and a preliminary attempt is made to define mycorrhizal associations. Part II consists of a series of chapters dealing in detail with the ectotrophic myzorrhizae of forest trees (their structure and development; the effect of habitat on the intensity of infection; the ecology and physiology of the fungi; and the mechanism of action of ectotrophic mycorrhizae as nutrient-absorbing organs, with a discussion of the ecological roles of mycorrhizal organs). Part III deals primarily with endotrophic mycorrhizae of the Ericales and Orchidaceae. Lesser-known associations of septate fungi in higher plants and the so-called phycomycetous mycorrhizae, widely present in important crop plants, are also discussed. There are subject and author indexes and a bibliography.

4265. CLODE, J. J. E. **The role of mycorrhizas in phosphorus translocation, P^{32} tracer.** Translation Service, Department of Internal Affairs, Wellington. 1958. pp. 12 + [24]. Transl. from parts of *Publ. Serv. flor. aqüíc. Portugal* 23 (2), 1956 (197–206). [See *F.A.* 20 No. 252.] Limited distribution.

4266. JENNINGS, D. H. **Changes in the internal carbohydrates of Beech mycorrhizas during treatment with azide.** *New Phytol.* 57 (2), 1958 (254–5). 5 refs. O.R.S.

Presents in a graph the combined results of the present and earlier studies [cf. *F.A.* 14 No. 3163; 17 No. 3713] showing the effect of NaN_3 on utilization of total sugar, soluble and insoluble carbohydrate, on respiration and on phosphate uptake.

4267. BOULLARD, B., and DOMINIK, T. Badania porównawcze nad mikoryzami *Pinus strobus* L. z różnych stanowisk we Francji i w Polsce. **[Investigations on mycorrhizae of *P. strobus* at different sites in France and Poland.]** *Prace Inst. bad. Leśn.* No. 178, 1958 (45–84). 30 refs. [Pol.pol.f.russ.g.]

Combined studies in France and Poland have shown that, in many cases, phytosociological relationships (not soil and climate) determine the type of mycorrhizae formed; that poor *P. strobus* growth is associated with the absence or shortage of mycorrhizae; that 26 different species of fungus are symbiotic with *P. strobus* though individual trees never have >4 species (usually $\ngtr 3$); and that the most important type of mycorrhiza is sub-type F [cf. *F.A.* 18 No. 1372].

4268. DOMINIK, T., and FERCHAU, H. Wstępne studium porównawcze mikoryz *Pinus strobus* L. w Ameryce i w Europie. **[A preliminary comparative study of *P. strobus* mycorrhizae in America and Europe.]** *Prace Inst. bad. Leśn.* No. 179, 1958 (85–99). 5 refs. [Pol.pol.e.russ.g.]

The following subtypes of mycorrhizae were collected from *P. strobus* in N. Carolina: Aa, Cd, Fa, Ff, Fg, Ga, Hf and Ja [see *F.A.* 18 No. 1372], of which Fg, Hf and Ja were not found on *P. strobus* in Europe. *P. rigida* and *Tsuga canadensis* growing with *P. strobus* in America never exhibited types Fg and Ja, which, under these phytosociological conditions, appear to be characteristic only for *P. strobus*. In Europe, Ja is known on *P. sylvestris* and *P. mugo*, but never occurs in the lowlands. The better development of *P. strobus* in America than in Europe is attributed to the difference in the fungal symbiosis, and trial inoculations should therefore be made in Europe to see whether the subtype Ja can be established with *P. strobus*.

4269. DOMINIK, T. Przyczynek do znajomości mikotrofizmu *Pinus banksiana* Lambert w drzewostanach. **[The mycotrophism of *P. banksiana* in stands.]** *Prace Inst. bad. Leśn.* No. 180, 1958 (101–16). 4 refs. [Pol.pol.russ.g.]

Investigations in 3- to 60-year stands of *P. banksiana* growing on poor soils in Poland revealed 15 kinds of mycorrhizae, of which the author's subtypes Ff, Ga and Hh [see *F.A.* 18 No. 1372] appeared to be characteristic for the species.

4270. PACHLEWSKI, R. Badania mikotrofizmu naturalnych zespołów roślinnych na hałdach górniczych w Knurowie i Gliwicach na Górnym Śląsku. **[Investigations on the mycotrophy of natural plant communities on slag-heaps in Knurów and Gliwice, Upper Silesia.]** *Prace Inst. bad. Leśn.* No. 182, 1958 (173–209). 7 refs. [Pol.russ.g.]

In continued investigations [cf. *F.A.* 18 No. 1374] the tree species, shrubs and ground flora found on various kinds of slag-heaps are listed, and the presence or otherwise of endo- and ectotrophic mycorrhizae indicated for each plant species.

4271. DOMINIK, T. Studium nad mikotrofizmem rodzaju *Populus*. **[Studies on the mycotrophism of the genus *Populus*.]** *Prace Inst. bad. Leśn.* No. 181, 1958 (117–72). 16 refs. [Pol.russ.g.]

[Cf. *F.A.* 18 No. 1373.] In investigations on 186 specimens of *Populus* (comprising 14 species and hybrids), the author indicates the age, root autotrophy, and the presence or otherwise of root-hairs, of endotrophic mycorrhizae of (*a*) thamniscophagous [arbuscular], (*b*) thamnisco-physalidophagous [vesicular-arbuscular], and (*c*) tolypophagous types [cf. *F.A.* 15 No. 3347], and of ectotrophic mycorrhizae. In young plants, (*a*) (*b*) and (*c*) usually appear only during the first year or two, and are then replaced by ectotrophic mycorrhizae. All Poplars are mycotrophic, but they can grow in places where there are no mycorrhizae (e.g. in streets) by developing very large numbers of root hairs. The mycorrhizae most frequently occurring with *Populus* spp. were of the subtypes Aa, Fb, Fg, Ga, Hg and Ia [cf. *F.A.* 18 No. 1371]. The author believes that endotrophic mycorrhizae of types (*a*) and (*b*) are harmless, but that type (*c*) is undesirable, and that there may be a connexion between parasitic attack on Poplars and the presence of type (*c*).

4272. LEVISOHN, I. **Researches on mycorrhiza.** *Rep. For. Res. For. Comm., Lond., 1957/58*, 1959 (96–8). 4 refs.

Further investigation of the differential effect of *Boletus scaber* on the root systems of Birch in different soils [cf. *F.A.* 20 No. 255] showed that, through the rhizosphere activity of the inoculated mycelium, which was accompanied by delay in mycorrhiza formation, the unprotected root systems of the experimental plants were exposed to attacks by a parasitic mycelium in the soil.

4273. LEVISOHN, I. **Strain differentiation in a root-infecting fungus.** *Nature, Lond.* 183 (4667), 1959 (1065–6).

As a result of unequal growth effects of different strains of *Boletus scaber* on Birch seedlings, pure-culture tests were made of 7 isolates of this fungus: (1) and (2) from heathland soils; (3) from a moorland soil; (4), (5), and (6) from deciduous woodland soils; and (7) a laboratory culture from Sweden. On the whole, (1) and (2) behaved similarly to each other and differently from the rest of the isolates, in a number of different tests, and the possibility of an ecological origin for the strain differentiation is tentatively suggested.

4274. ANVERY, S. A. A., and KHAN, S. A. **Observations on mycorrhizae on *Pinus roxburghii* (Chir), *P. wallichiana* (Kail) and *Cedrus deodara* (Deodar) in the Murree Hills.** *Pakistan J. For.* 9 (2), 1959 (137–8).

Examination of a number of seedlings, 1–5 years old, has established the presence of both ectotrophic and endotrophic mycorrhizae on the sublateral rootlets of all three species. The long roots do not appear to exhibit regular mycorrhizal associations. Detailed investigations are in progress.

4275. WARD, E. W. B., and HENRY, A. W. **Differential reaction of saprophytic and parasitic soil-inhabiting fungi to indoleacetic acid.** *Nature, Lond.* 183 (4667), 1959 (1064). 6 refs.

In the course of experiments on the effects of indoleacetic acid (IAA) on two saprophytic (*Trichoderma viride* and *Trichocladium asperum*) and two plant-parasitic (*Ophiobolus graminis* and *Fomes annosus*) fungi, growth of the latter was found to be much more readily inhibited than that of the former. Neither *T. viride* nor *T. asperum* was significantly inhibited by concentrations of IAA up to $100 \times 10^{-5}M$, whereas *O. graminis* and *F. annosus* were significantly inhibited at concentrations of 10 and $1 \times 10^{-5}M$ respectively, and completely inhibited at higher concentrations. A number of unidentified saprophytic soil fungi behaved similarly to *T. viride* and *T. asperum*, in that the higher concentrations of IAA did not significantly reduce growth. [Cf. *F.A.* 15 No. 1050.]

181.36. Root Relations and Root Development etc.

See also Nos. 4135, 4251, 4460–1, 4609, 4791, 4878.

4276. Staebler, G. R., and Rediske, J. H. **Progress in developing a radioactive tracer technique for mapping roots of Douglas Fir**. *Proc. Soc. Amer. For.* 1958 (1959), (164–6).

When Rb^{86} was injected into the bole of a 12-year-old tree, the plotted isolines of radioactivity measured on the ground agreed quite well with the root pattern as found by excavation.

4277. Woods, F. W. **Slash Pine roots start growth soon after planting**. *J. For.* 57 (3), 1959 (209). 1 ref.

Root growth had started 22 days after planting on all 4 Slash Pines in the trial, but on only 2 of the 4 Longleaf Pines and on 2 of the 4 Sand Pines. Observations in other years supported these findings.

4278. DeByle, N. V., and Place, I. C. M. **Rooting habits of Oak and Pine on Plainfield sand in Central Wisconsin**. *For. Res. Note Wis. Coll. Agric.* No. 44, 1959. pp. 2.

A study was made of the distribution and quantity of roots under both pure and mixed stands of Pine (*Pinus banksiana*) and stunted Northern Pin and Bur Oaks (*Quercus ellipsoidalis* and *Q. macrocarpa*), which cover thousands of acres of infertile sands in central Wisconsin. The Oaks were in all cases more deeply rooted than the Pine, their tap roots being traced to depths of >10 ft., whereas few Pine roots of any kind were identified below 3 ft. Oven-dry weight of all roots to a depth of 5 ft., in g./sq. ft., was: (1) pure Oak (30 to 35 years old) 461, (2) mixed wood 201, (3) pure Pine (25 years old) 102–128. A much higher % of Pine than of Oak roots occurred in the top 6–8 in. of soil, but the absolute quantity of roots in the top 6 in. was very much greater under Oak or mixed wood. Organic-matter content in the A horizon was only 1·5% under Pine vs. 4% under Oak or mixed wood. Exchangeable Ca, K, and Mg were all higher under Oak.

4279. Kraevoj, S. Ja. O prisposobitel′nyh izmenenijah kornevyh sistem drevesnyh rastenij na soloncah. [**Adaptations in the root systems of woody species growing on solonetz soils**.] *Dokl. Akad. Nauk SSSR* 122 (6), 1958 (1115–8). 10 refs. [Russ.] A.P.B.

Root systems of 6-year-old *Quercus robur* and *Tamarix gracilis* were studied in the Ergeni hills on a 6-ha. area of light-chestnut soils with a tendency towards solonetz formation and with patches of actual solonetz soil. The land had been deep-ploughed and fallowed for 1½ years before planting. The profiles and salt contents of the soils are tabulated. In both species, the root systems were normally developed, reaching a depth of 350 cm., in the chestnut soil; in the solonetz, however, the vertical roots, on reaching the most compact and saline layers (containing frequent inclusions of $CaCO_3$), twisted corkscrew-wise, increasing the chance of penetration to deeper layers. Despite this behaviour, the roots of Oak had not succeeded in penetrating deeper than ca. 130 cm. in the solonetz, and the root system was very poorly developed in general; height growth was correspondingly poor, probably owing to the restriction of summer water supply by the shallow root system. Tamarisk roots penetrated much deeper (225 cm.) than Oak roots and the plants generally showed only slightly less growth than those in chestnut soil. Attempts are being made to select forms of Oak better adapted to solonetz soils.

4280. Macharáček, M. Několik poznatků o stavu a uspořádání kořání v lesních porostech. [**The condition and arrangement of roots in forest stands**.] *Sborn. čsl. Akad. zeměd.* (*Lesn.*) 5 (3), 1959 (307–18 + 1 plate). 2 refs. [Cz.cz.russ.g.]

A discussion with reference to data obtained from individual specimens of Oak, Beech, Scots Pine and Larch in a mixed stand, and from pure Spruce. Trees with the greatest volume had the biggest root systems.

4281. Šika, A. Kořenový systém ořešáku černého. [**The root system of *Juglans nigra*.**] *Sborn. čsl. Akad. zeměd.* (*Lesn.*) 5 (3), 1959 (267–90). 10 refs. [Cz.cz.russ.g.]

Investigates the morphology and ontogeny of the root system of young and mature *J. nigra* trees at different sites in Czechoslovakia, including the extent of root formation at various depths down to 260 cm.

4282. Zimmer, W. J., and Grose, R. J. **Root systems and root/shoot ratios of seedlings of some Victorian Eucalypts**. *Aust. For.* 22 (1), 1958 (13–8). 7 refs.

Root systems of seedlings of 14 species are described. Their root growth is compared with their shoot growth on the basis of length, oven-dry weight, and fresh weight. The species native to dry areas develop a long tap-root with few weak laterals, those on more favourable sites usually a shallow, fibrous root system. Root/shoot ratios of species from dry areas were higher than those for species from moister zones. A similar trend was apparent with seedlings of *E. sideroxylon* from seeds collected along the moisture gradient within its distribution range. *From authors' summary.*

4283. Chattaway, M. M. **Bud development and lignotuber formation in Eucalypts**. *Repr.* from *Aust. J. Bot.* 6 (2), 1958 (103–14 + 2 plates). 3 refs.

The minute structure of lignotubers is described and their development studied from their earliest inception in the cotyledonary and lower leaf nodes. The structure of the bud components of the leaf and cotyledonary nodes of tubering and non-tubering species has been compared. Lignotubers can only develop in species in which concealed buds are present above as well as below the axillary buds. Other factors may, however, inhibit their development even when the necessary buds are present. *Author's summary.*

4284. Butzonitch, I. P. Los nódulos del cuello en los eucaliptos. **[Root-collar tumours ['lignotubers'] in Eucalypts.]** [*Pap.*] *1^{as} Jorn. argent. Eucalipto Asoc. for argent.* No. 241–200, 1957. pp. 14. 25 refs. [Span.]

A review of present knowledge with some observations made on 25 species of Eucalypts in Buenos Aires province. [Cf. *F.A.* 18 No. 4376.]

4285. Ortmann, C. Kurzer Beitrag zur Frage arteigener Wurzeltypen bei *Salix*. **[Specific variation in the root systems of Willows.]** *Arch. Forstw.* 7 (10/11), 1958 (888–910). 13 refs. [G.g.russ.e.]

Examination of some thousands of plants of 7 species of Willow and their hybrids, from the seedling stage on, showed only the 'heart-root' system [cf. *F.A.* 18 No. 1380]. The root systems of interspecific crosses showed extreme variability which may be correlated with the yield capacity of the clones involved. Long cuttings set at a depth of 40 cm. in coarse sand columns juxtaposed to columns of loam in a greenhouse, were used to study the distribution of functions in the root system. Evidence from this and from elsewhere shows that there are horizontal 'feeders' exploring well aerated superficial layers, and deeper-going 'drinkers' and supporting roots. The development of root systems from cuttings (5 species) set in black earth, and brown *vega* [alluvial soil] and eugley flood-plain soils with water tables at >60, >145 and 20–30 cm. respectively (with occasional flooding), is illustrated. Conclusions are drawn from the ratio of adventitious basal-cut wound roots, and their length and diameter, as to the specific requirements of the clones for O, and the specific reaction to standing groundwater shown by the root distribution. Mean annual yields of osiers in 100 kg./ha. are shown for 4- or 6-year *S. americana* and *S. alba* var. *vitellina* on a brown-coal tip, sandy forest, and flood plain (eugley) soils [cf. *F.A.* 19 No. 405]. The former species is superior on the first two soils, both of which are greatly inferior in production to the eugley, on which the mean yield of the latter species is ca. 225 against 145 for the former.

181.4. Reaction to Biotic Influences (Competition etc.) and Fire

See also Nos. 4263, 4320, 4731–4.

4286. **Loblolly Pine seedlings sprout.** *Rep. Ntheast. For. Exp. Sta. 1958*, 1959 (18).

Coppice shoots from 1- to 2-year old *P. taeda* seedlings cut at 9 in. from the ground, showed 90% survival after 3 years. Coppicing was rarer in 9- to 13-year trees and few shoots survived. The shoots arise from dormant buds on the lower part of the stem, so that fire or cutting close to the ground will prevent coppicing.

181.5. Reproductive Behaviour

See also Nos. 4151–3, 4157, 4162, 4282–4, 4286, 4376 *et seq.*, 4420 *et seq.*, 4877.

4287. Keith, W. M., Jr. **Analysis of vegetative propagation in *Quercus prinoides*.** *Rhodora* 59 (708), 1957 (306–8). O.B.D.

Specimens of *Q. prinoides* were found in Jefferson County, Kansas, having no tap-root, but connected by a rhizome to a series of aerial shoots. Since *Q. muehlenbergii* never spreads vegetatively, this character may be useful in distinguishing the two taxa. The survival value and evolutionary significance of this means of propagation are discussed.

4288. Ciampi, C. Il ciclo riproduttivo nei ginepri italiani della sez. ***Oxycedrus***. **[The reproductive cycle in Italian Junipers of the *Oxycedrus* section.]** *Ann. Accad. ital. Sci. for.* 7, 1958 (393–430). 44 refs. [It.f.]

Juniperus macrocarpa, *J. oxycedrus* and *J. communis* are studied and compared.

4289. Baker, H. G. **Studies in the reproductive biology of West African Rubiaceae.** *J. W. Afr. Sci. Ass.* 4 (1), 1958 (9–24). 25 refs. H.S.B.

Includes observations and experiments on Psychotrieae and Mussaendeae in regard to their heterostyly (including intraspecific pollen-size differences), self compatibility, functional dioecism etc., with chromosome counts for *Psychotria* and *Uragoga*.

4290. Harris, B. J., and Baker, H. G. **Pollination in *Kigelia africana* Benth.** *J. W. Afr. Sci. Ass.* 4 (1), 1958 (25–30 + 4 photos). 12 refs. H.S.B.

Describes the flowering of *K. africana* and visits by the hawk moth *Nephele vau* and the fruit-eating bat *Micropteropus pusillus*, with photographs, and discusses their role as probable pollinators.

4291. Söderström, V. Ett exempel på fröspridning. **[An example of seed dispersal.]** *Skogen* 46 (9), 1959 (194–5). 6 refs. [Sw.]

Presents results of a study in March 1955 on the number and quality of seeds from a 70- to 80-year Spruce stand, carried by a N.N.W. wind and lying on snow that had fallen the previous day. Graphs are given showing the relations between the number of seeds on various plots, amount of viable seed, 1000-seed weight, wing area, and germination %. The number of seeds, 1000-seed weight and germination % all decreased with increasing distance from the stand, the number of viable seeds decreasing rapidly in a zone 30–50 m. from the stand. Other Scandinavian studies on seed distribution are discussed.

4292. Applequist, M. B. **Longevity of submerged Tupelogum [*Nyssa aquatica*] and Baldycypress [*Taxodium distichum*] seed.** *LSU For. Notes La. agric. Exp. Sta.* No. 27, 1959. pp. 2. 3 refs.

Seed of both species will tolerate submergence for a few months under field conditions. *T. distichum* seed loses its viability within a year; *N. aquatica* seed will retain viability for 14 months but not for as long as 21 months.

181.6. Life Form, Habit. Post-Seedling Development and Form

See also Nos. 4184–6, 4416, 5015–7, 5027.

4293. Campbell, R. K. **Variations in crown form attributes in populations of *Pseudotsuga menziesii* (Mirb.) Franco (Douglas Fir).** *Abstr. of thesis*, in *Dissert. Abstr.* 19 (7), 1959 (1497–8). O.R.S.

Crown characteristics studied on 300 trees from

10 localities in S.W. Washington were length and volume of a predetermined stem section; number, length and angle of branches; and cross-sectional area [c.s.a.] of branch bases. Variation between whorls within a tree proved to be small for branch length and angle if the effect of age on branches was considered, but variation in the stem inter-whorl length and in the ratio of surface area of stem to c.s.a. of branch bases was very large. A study of the variation between trees in a given locality showed Douglas Fir to be extremely variable in crown characteristics; the magnitude of the variation in any characteristic was generally positively related to the height-growth potential of the locality. Statistically significant differences between locality means were found for each attribute, even after statistical controls were employed in the analysis to reduce variability due to environmental diversity of the localities. Possible patterns of geographic variation were deduced from consideration of adjusted locality mean values for number of branches, length of branches and c.s.a. of branch bases; the difficulty of ascribing these phenotypic differences between localities to hereditary causes is discussed. A study of the relationship between the volume of a specified stem section and 4 crown attributes indicates that ca. 36% of the variation in the stem volume can be explained by corresponding variation in the c.s.a. of the bases of branches inserted in this section. Their mutual association with other crown variables was considered. Ca. 37% of the variation in stem volume cannot be associated with corresponding variation in branch characteristics.

4294. McCabe, R. A., and Labisky, R. F. **Leader forking of Red and White Pines in plantations.** *J. For.* 57 (2), 1959 (94–7). 9 refs.

The incidence and causes of forking are discussed on the basis of recent studies in *Pinus resinosa* and *P. strobus* plantations in the University of Wisconsin Arboretum, and studies by other authors there and elsewhere. Possible causes or influencing factors are: prolepsis (Lammas-shoot formation); growth-promoting substances from fungi; inheritance; damage to leader or terminal bud; or the age of the tree. The influence of site and weather conditions on forking cannot be ruled out, but no correlation could be found between incidence of forking and three weather factors (precipitation, and max. and min. temperature). It is possible that there may be periodic peaks (ca. 10–11 years apart) in forking in Pines. Data are given on a successful pruning experiment aimed at producing normally shaped trees from forked Pines in a demonstration forest.

4295. [Day, W. R.] **Studies in 30- to 35-year-old, even-aged, Spruce stands with reference to the development of fluting, bark necrosis, and variations in crown density.** *Rep. imp. For. Inst., Oxf. 1957/58*, 1958 (13–5).

Studies in a number of plantations indicate that mortality before the first thinning is a site characteristic, varying from 2 to 66%. Death is due mainly to competition. If early thinning gives space for a relatively even development in size of trees, there is a tendency, according to the severity of site conditions, not to respond vigorously in crown development to increased growing space, so that an open canopy begins to develop. Some form of root debility seems always to accompany this condition. The occurrence of fluting was studied in stands on soils permitting only shallow rooting. Fluting is favoured by sites that prevent the full development of heart roots [roots central to the system], tends to appear first on dominants, and is favoured by heavy thinnings that stimulate the development of dominants. Bark necrosis within the flutes commonly occurs when fluting is at all severe. Fluting commonly arises between two main root junctions. Drought cracks also arise above such inter-root spaces and not uncommonly develop into shallow flutes. Fluting also commonly develops above wounds made in the main roots or at the base of the bole during extraction of thinnings. Severe basal fluting has developed in Western Hemlock (*Tsuga heterophylla*) after the death of heart roots associated with *Fomes annosus* infection. There is some evidence that within a well developed flute, with the bark still living, the moisture content is lower than on either side of it.

4296. Krajicek, J. E. **Epicormic branching in even-aged undisturbed White Oak stands.** *J. For.* 57 (5), 1959 (372–3). 5 refs.

One hundred White Oaks in each of 4 crown classes (dominant to suppressed) were selected in 95-year stands untouched for the previous 20 years. The number of epicormics per tree (on the lowest 17 ft. of the stem) varied from <3 on dominants to almost 10 on suppressed trees. The number of faces (N.W., N.E., S.E., S.W.) free from epicormics varied from almost 3 on dominants to <1 on suppressed trees. It would appear from this that high-quality White Oaks cannot be grown in even-aged mixtures with the more rapidly-growing Black Oaks.

4297. Weihe, J. Der Einfluss der Vegetationszeit und der Niederschlagsmenge auf die Höhenwuchsleistung und Bestockungsdichte von Fichtenbeständen. **[The influence of length of growing season and precipitation on height growth and density of Spruce stands.]** *Allg. Forst- und Jagdztg.* 130 (6), 1959 (162–5). 19 refs. [G.g.e.]

An analysis of 309 stands in Baden [cf. *F.A.* 19 No. 4636]. With increasing mean annual temperatures in the range 4–9° C. (considered as indicative of length of growing season for this region), site class increased and relative stand density decreased. Density, however, increased with increasing mean summer rainfall (180–400 mm. for May to July) while site class appeared not to be affected. [Cf. *F.A.* 20 Nos. 2592–3.]

181.7. Duration, Longevity, Stature; Records of Exceptional Age or Size. Effects of Age on Behaviour

See also Nos. 4393, 4877.

4298. Schaffalitzky de Muckadell, M. **Investigations on aging of apical meristems in woody plants and its importance in silviculture.** *Forstl.*

Forsøgsv. Danm. 25 (4), 1959 (307–455 + 2 photos). 8 pp. of refs. [E.e.dan.]

[Cf. *F.A.* 19 No. 192.] Summarizes the history, since the 18th century, of investigations on juvenile and adult stages in plants, with particular reference to e.g. clonal senility, leaf anatomy, thorns, fruit trees, heredity, rejuvenation, silvicultural aspects and leaf retention, with a section on terminology. Presents the results of recent studies by the author on variation with meristematic age in leaf retention of *Fagus sylvatica*, *Quercus robur* and *Q. sessiliflora*, and *Carpinus betulus*, autumn colouring in *Q. borealis*, green or purple colouring, leaf form and flowering in *Fraxinus excelsior*, branching of *Acer pseudoplatanus*, leaf size and branching of *Ulmus carpinifolia*, thorniness of *Robinia pseudoacacia*, formation of opposite terminal buds of *Syringa vulgaris*, rooting of cuttings of *Populus* × *serotina*, and flowering and anthocyanin formation of *Hedera helix*, concluding that age changes in the apical meristem of woody plants is a common, and probably universal phenomenon. Juvenile forms should therefore not be regarded as curious exceptions, but as easily observable examples of meristematic age changes. Further investigations on Beech and Ash demonstrated that juvenile forms of both show later flushing, greater diameter increment and greater resistance by the bark, e.g. to sun scorch and temperature variations. The probability that meristematic ageing as well as increased respiration and water transport difficulties is responsible for decreased volume increment in older stands, is discussed.

4299. HERRMANN, S., and MEYER, H. Zur Frage der 'Klonalterung' bei Pyramidenpappeln. **[The problem of 'senescence of clones' in *Populus nigra* var. *italica*.]** *Allg. Forstzeitschr.* 14 (9), 1959 (196–8). 16 refs. [G.]

The great similarity in pathological symptoms (bark splits and bark necroses, attributed primarily to frost, secondarily to fungi) exhibited by a group of 11-year-old *P. nigra* var. *italica*, presumed to be the progeny of a ♀ and a ♂ Lombardy Poplar in Hann. Münden and by another group of the same age raised from cuttings, is interpreted as evidence for the environmental causation of these symptoms, and against the theory of clonal senescence.

181.8. Phenology

See also Nos. 4170, 4195, 4249, 4298, 5016, 5091.

4300. HORTON, K. W. **Seasonal leader growth of Lodgepole Pine in the subalpine forest of Alberta.** *For. Chron.* 34 (4), 1958 (382–6).

The weekly leader growth of Lodgepole saplings, recorded over 4 seasons on the uniform soil of a moraine, showed similar patterns, but at different rates according to aspect, the S. aspect yielding the fastest growth. The seasonal growing period consistently started in early May and was 12 weeks long, but within this period the distribution of growth differed widely from year to year. A direct relationship existed between weekly growth and corresponding mean weekly temperatures, except towards the end of the growing season.

4301. COINTAT, M. Observations sur la foliaison du hêtre. **[Leaf-flush of Beech.]** *Rev. for. franç.* 11 (3), 1959 (214–7). [F.]

Dates of completed leaf-flush and leaf-fall were noted for 5 consecutive years on 9 individuals in the forest of Dhuits (Haute-Marne). The dates of flushing varied by as much as 1 month between individuals in one year, and by as much as 1 week between years, but the order in which the 9 trees flushed was always the same. Date of leaf-fall was less consistent.

4302. SEBALD, O. Beobachtungen über den jahreszeitlichen Verlauf von Belaubung, Entlaubung und Dickenwachstum bei verschiedenen Pappelsorten. **[The seasonal course of flushing, leaf-fall and diameter increment in different Poplar varieties.]** *Mitt. Ver. forstl. Standortskunde ForstpflZücht.* No. 8, 1959 (34–41). 9 refs. [G.g.]

Observations were made for 3 years on date of flushing, leaf-fall, and diameter growth of young hybrid Poplars on a trial plot near Stuttgart. Balsam × Black-Poplar hybrids ('Rochester,' *Populus generosa* × *P. nigra*, *P. generosa* × *P. serotina*, *P* × *berolinensis*, 'Oxford') flushed earlier than the Black-Poplar hybrids (*P.* × *robusta*, *P.* × *regenerata*, 'Hohenlübichow, *P.* × *serotina*), the difference being much greater in an early than in a late spring. Some early flushers shed their leaves early and some late. Diameter growth started during flushing, was greatest from May to mid-July, and ended in September. Cool weather in the early part of the growing season markedly reduced growth.

182. Synecology, Plant Sociology: General, Principles and Methods

4303. TÜXEN, R., and MEISSNER, H. Bibliographia Phytosociologica Germania, Pars VI (1954–1955 und Nachträge). **[Bibliography of phytosociology in Germany, VI. 1954–55 and supplements.]** *Mitt. florist.-soziol. Arbeitsgemeinsch.* No. 6/7, 1957 (340–61). 22 pp. of refs. [G.]

References are listed alphabetically under authors.

4304. TRAUTMANN, W. Bibliographie zum Problem Pflanzensoziologie und Pollenanalyse (Palynologie). **[Bibliography of plant sociology and pollen analysis.]** *Mitt. florist.-soziol. Arbeitsgemeinsch.* No. 6/7, 1957 (362–8). 6 pp. of refs. [G.]

Mainly German references, arranged alphabetically under authors, covering the period 1930–57.

4305. RABELER, W. Bibliographie zum Fragengebiet Tier- und Pflanzensoziologie (Biozönotik). **[Bibliography on animal and plant sociology (biocoenotics).]** *Mitt. florist.-soziol. Arbeitsgemeinsch.* No. 6/7, 1957 (369–80). 11 pp. of refs. [G.]

Mainly German references, arranged alphabetically under authors, covering the period 1930–57.

4306. TÜXEN, R. [Editor]. Bericht über das internationale Symposium Pflanzensoziologie-Bodenkunde von 18. bis 22.9.1956 in Stolzenau/Weser. **[Report of the international symposium on plant sociology and soil science at Stolzenau/Weser, 18–22 Sept. 1956.]** *Angew. PflSoziol., Stolzenau* No. 15, 1958. pp. 203 + 3 tbls., 2 sketchmaps. [G.]

Contains 20 contributions with discussions, including the following: Soil and vegetation mapping of natural and artificial forest communities in the *Quercion robori-petraeae* region of the Veluwe [Netherlands] (*V. Westhoff*); Forest communities in central Styria in relation to soil profiles (*J. Eggler*); Plant sociological, climatic and pedological aspects of deciduous-Oak zones in S.E. Europe (*I. Horvat*); and Preliminary investigations on the biochemical characters of the humus under some forest communities in the Alsace plain (*G. Lemée et al.*) [this last paper describes the humus layer of a *Pruneto-Fraxinetum*, a *Querceto-carpinetum* and two forms of *Quercetum medioeuropaeum*, all on coarse alluvial sands but showing characteristic differences in texture, thickness, C and N content, pH, CO_2 production, N mineralization, etc.].

182.1. Palaeoecology. History of Vegetation. Pollen Analysis .

See also Nos. 4161, 4304.

4307. HYDE, H. A. **Atmospheric pollen in relation to land use**. *Nature, Lond.* 183 (4676), 1959 (1694–5). 11 refs.

Summarizes the results of two complete sets of daily analyses of atmospheric pollen at two stations in high, relatively treeless, localities in the Brecknockshire mountains, showing total tree pollen and non-tree pollen; and discusses the relevance of these findings to pollen analysis of peat deposits.

4308. RAY, A. **The effect of earthworms in soil pollen distribution**. *J. Oxf. Univ. For. Soc.* (*Ser. 5*) No. 7, 1959 (16–21). 7 refs.

An experiment was designed to determine whether or not the larger casting earthworms bring about incorporation of pollen into and through the mineral soil. It was shown conclusively that the larger earthworms will ingest pollen from the soil surface and distribute it through the soil in which they are working. They do this at a rapid rate, for in some of the pots in the experiment the concentration of pollen in the deeper layers after 8 weeks was almost the same as that at the surface, where it had been sprinkled at the beginning of the experiment. There was no evidence that the pollen exine was adversely affected by its passage through the worm's gut. Pollen obtained from worm casts in the field showed similar good preservation. It is clear that this activity must mean that in soils where casting earthworms are active, they must cause a blurring of the pollen stratification. The relation of these findings to field conditions is discussed.

4309. DUMITRIU-TATARANU, I. Origine et position systématique des îlots de hêtre du sud-est de la France. [**The origin and systematic position of islands of Beech in the S.E. of France**.] *Rev. for. franç.* 11 (3), 1959 (199–213). 17 refs. [F.]

Reviews the controversy on the origin of the Beech woods of Ste. Baume and Valbonne [cf. *F.A.* 19 No. 3661], i.e. whether or not they are relics of prehistoric vegetation; and also discusses their morphological peculiarities and those of similar Beeches in Rumania, which are variously explained as the result of hybridization between *Fagus sylvatica* and *F. orientalis* or as representing a survival of intermediate forms between a Tertiary *Fagus* sp. and *F. sylvatica.*

4310. NOIRFALISE, A. Esquisse d'une paléohistoire des forêts belges. [**An outline of the prehistory of the Belgian forests**.] *Ann. Gembl.* 65 (1), 1959 (1–13). 17 refs. [F.] A.P.B.

A reconstruction based on pollen analyses.

4311. MCKELVEY, P. J. **Forest history and New Zealand prehistory**. *New Zealand Science Review, Wellington* 16 (3/4), 1958 (28–32). 11 refs. L.S.

Traces from survey material of the N.Z. indigenous forests and from research work, the history of indigenous forests since the Pleistocene, characterized by the colonization of vast areas of tundra and grassland; modification by climatic oscillations; intermittent volcanic bombardment (in the North Island), and extensive burning and land-clearing by both Maoris and Europeans.

4312. HARRIS, W. F. **Pollen analysis and archaeology**. *New Zealand Science Review, Wellington* 16 (3/4), 1958 (27–8). 8 refs. L.S.

Work on pollen analysis in New Zealand is reviewed. From a Maori wooden scoop dug up from 4 ft. of peat, but already cleaned and in a museum, >1000 pollen grains and spores were collected, sufficient for correlation with a stratigraphic horizon. The radio-carbon method of dating, which would have destroyed the artefact, can be used to date the peat horizon. The results of the pollen analysis are shown.

182.2. Succession, Alternation and Periodicity in Vegetation

See also Nos. 4331, 4337, 4342, 4345, 4731–4.

4313. TAYLOR, J. C. **A preliminary study of forest tree succession after clearcut of mature Hemlock stands in Southwest Nova Scotia**. *For. Chron.* 35 (1), 1959 (50–8). 5 refs.

Examination of 12 different-aged, naturally regenerated areas, the result of clearcutting of mature Hemlock stands, showed that the ecological composition was much the same in 8 of them. All the the tree species in the observed succession were alike in their ecological behaviour. Projection of the data from the observed succession indicated that, as the stand became increasingly mature, the proportion of commercial trees in the association increased. No significant difference occurred between the mean number of trees per plot for commercial and non-commercial species, either (i) before and during, or (ii) after the cut. On the basis of this preliminary survey it appears that natural regeneration in the areas studied will produce a forest of commercial value. *From author's abstract.*

4314. ISAAK, D., MARSHALL, W. H., and BUELL, M. F. **A record of reverse plant succession in a Tamarack bog**. *Ecology* 40 (2), 1959 (317–20). 3 refs.

Decreased rate of growth and increased mortality of Tamarack [*Larix laricina*] appear to be related to the rise in the water level caused by the increased precipitation since the early 1940's. Pronounced increase in the number of shrub and herbaceous species accompanied the change in Tamarack canopy and rise in water level. *From authors' summary.*

4315. MITCHELL, B. A. **The ecology of tin mine spoil heaps. Part 1. Sand and gravel tailings.** *Malay. Forester* 22 (2), 1959 (111–32 + 4 photos). 8 refs.

Even after such tailings have lain undisturbed for 20 years, the restoration of natural fertility is so slow that levels of fertility have risen only to ca. $\leqslant \frac{1}{3}$ of those in comparable unmined ground. Recolonization by plants is extremely slow and largely dependent on the passage of cattle across the tailings.

4316. SCHAEFFER, R., and MOREAU, R. L'alternance des essences. **[The alternation of species.]** *Bull. Soc. for. Franche-Comté* 29 (1; 2), 1958 (1–12; 76–84); 29 (5), 1959 (277–88). 43 refs. [F.]

A review of literature (mainly French and German).

182.4. Layer Communities

4317. BARKMAN, J. J. **Phytosociology and ecology of cryptogamic epiphytes, including a taxonomic survey and description of their vegetation units in Europe.** Van Gorcum & Comp. N.V., Assen. 1958. pp. xiii + 628 + 41 tbls. in suppl. 425 refs. [E.] Price *Fl.* 44. X.

Based on extensive personal observations (mainly in the Netherlands) and 425 references, the chapters cover: (I) The scope of the work, area examined and *desiderata* for future study; (II) The habitat of the phorophyte (e.g. of the tree providing the substratum), the habitats provided by the phorophyte (e.g. in a tree's bole and branches); (III) Taxonomy, classification by life- and growth-forms, competition, succession etc., in cryptogamic epiphytes; (IV) Chorology (distribution by dispersal and geographical range of species and communities, changes in range, division of Europe and the Netherlands into phytogeographical regions); and (V) Techniques for studying epiphytic associations, used by the Zurich-Montpellier school. A second part is devoted to descriptions of the known cryptogamic associations of Europe with a discussion of their affinities, nomenclature, distribution etc. This section is supported by many maps showing distribution in the Netherlands and by 6 association tables. There is a 34-page index to scientific names.

4318. HORIKAWA, Y., and NAKANISHI, S. **Study on the vertical distribution of epiphytic bryophytes on Beech trees *Fagus crenata* Blume.** *Bot. Mag., Tokyo* 69 (813), 1956 (118–26). 7 refs. [E.e.] I.M.I.

Association tables and growth-form data are given for bryophytes on trees subjected to moist sea winds on mountain ridges (30 species) and on trees on the drier slopes (14 species). Both associations are considered to be climatic climaxes, the vertical zonation (detailed) indicating microclimatic differences.

4319. KNAPP, R. Untersuchungen über den Einfluss verschiedener Baum-Arten auf die unter ihnen wachsenden Pflanzen. **[The influence of different tree species on the plants growing beneath them.]** *Ber. dtsch. bot. Ges.* 71 (9), 1958 (411–21). 15 refs. [G.g.] O.B.D.

Presents an analysis of the understorey and ground cover in parts of the S. and E. Odenwald, in 3 types of forest on bunter sandstone, described as follows: (1) *Vaccinium myrtillus* forests of the *Quercion roboris-petraeae*, (2) *Oxalis acetosella* forests of the *Fagetalia*, and (3) *Rubus* forests of the *Q. roboris-petraeae* evolving towards the *Fagetalia.* In all these types of forest there exist areas in which Oak (*Q. robur* and *Q. sessiliflora*), Beech, Pine or Spruce predominate, forming almost pure stands, and a special analysis was made of the species composition in such areas. The influence of individual tree species on the understorey and ground cover is considerable, but more quantitative than qualitative. On the basis of their occurrence in these 3 types of forest, under particular tree species, the species of the understorey and ground cover are classified into 18 groups.

4320. KARPOV, V. G. Konkurencija kornej drevostoja i stroenie travjano-kustarničkovogo jarusa v taežnyh lesah. **[Tree root competition and the structure of the herbaceous and shrub layers in taiga forests.]** *Dokl. Akad. Nauk SSSR* 119 (2), 1958 (375–8). 7 refs. [Russ.] A.P.B.

Briefly describes experiments in Vologda, in a dense 115-year-old Spruce stand with ground vegetation consisting chiefly of *Vaccinium* spp., *Oxalis acetosella*, *Trientalis europaea*, *Maianthemum bifolium* and mosses such as *Hylocomium splendens*, *Pleurozium schreberi* and *Dicranum scoparium.* Plots were either left with ground vegetation intact (*a*), or the ground vegetation was cleared (*b*), and in both variants plots were isolated from tree roots by trenching to 50 cm. depth or exposed to normal root action. On (*a*), when trenched, the ground vegetation showed a marked increase in growth and density, and after 3 years the moss layer was almost completely suppressed; the trenched plot of (*b*) was heavily colonized by *Rubus idaeus*, *Epilobium angustifolium* and *E. montanum*, though none of these became established on untrenched plots. Soil samples showed no significant differences in moisture content of the rooting zone in the different plots, but trenched plots showed much higher contents of mobile forms of N. It is concluded that competition for mineral nutrients is the chief factor determining the composition and structure of the ground vegetation under these conditions.

182.5. Synecological Measurements and Methods

See also No. 5033.

4321. WYATT-SMITH, J. **Methods used for the ecological study of Malayan forest vegetation.** *Malay. Forester* 22 (2), 1959 (142–52). 19 refs.

A paper presented to the UNESCO Symposium on 'The Vegetation of the Humid Tropics', Bogor, Indonesia, Dec. 1958.

187. Vegetation Types

See also Nos. 4048, 4074–5, 4079, 4086, 4090, 4204, 4240, 4375, 4376–7, 4387, 4496, 4524, 4731, 5420, 5452.

4322. Aichinger, E. Die Zwergstrauchheiden als Vegetationsentwicklungstypen. **[Dwarf-shrub heaths as 'vegetation development types'.]** *Angew. PflSoziol., Wien* Nos. 13, 1957, pp. 84; 14, 1957, pp. 171. [G.]

Continuing earlier work [see *F.A.* 14 Nos. 2047–53, 19 No. 215], No. 13 deals with three types of *Rhododendron* heath, the *Rhodothamnetum*, and the *Loiseleurietum*, and No. 14 with the following heaths: *Arctostaphylos uva-ursi*, *Arctoetum alpinae*, *Vaccinium myrtillus*, *V. uliginosum*, *Vaccinietum vitis-idaeae*, *Empetretrum*, *Globularietum cordifoliae*, and *Dryas octopetala*.

4323. Lohmeyer, W. Der Hainmieren-Schwarzerlenwald (*Stellario-Alnetum glutinosae* [Kästner 1938]). **[The *Stellario-Alnetum glutinosae*.]** *Mitt. florist.-soziol. Arbeitsgemeinsch.* No. 6/7, 1957 (247–57 + 2 tbls.). 16 refs. [G.]

A description of the association at several sites in W. Germany.

4324. Tüxen, R. Der Geissbart-Schwarzerlenwald (*Arunco-Alnetum glutinosae* [Kästner 1938]). **[The *Arunco-Alnetum glutinosae*.]** *Mitt. florist.-soziol. Arbeitsgemeinsch.* No. 6/7, 1957 (258–63 + 1 tbl.). 2 refs. [G.]

A description of the association in the Bayerische Wald (W. Germany).

4325. Passarge, H. Vegetationskundliche Untersuchungen in den Wäldern der Jungmoränenlandschaft um Dargun/Ostmecklenburg. **[Vegetation researches in the forests on the recent moraines about Dargun (East Mecklenburg).]** *Arch. Forstw.* 8 (1), 1959 (1–74). 33 refs. [G.g.russ.e.]

A detailed study over 275 sq. km. of the following associations: (1) Alder fen, (2) riparian Ash, (3) Alder/Ash, (4) Birch on peat bogs, (5) Sycamore Maple/Ash, (6) Lime/Beech, (7) Ash/Beech, (8–10) three Beech/grass associations. The Beech types (8–10) account for 31% of the area, and mixed Beech types (6–7) for 18%, while 35% is under planted conifers. Association tables, and soil and soil-water data, are included and the species and silvicultural systems suitable to the sites are discussed. The effect of conifer planting on the vegetation in relation to its diagnostic value is considered. One map gives the potential extent of the various associations in the whole area. The % of each by area is tabulated together with the % composition of the tree species in each.

4326. Mraz, K. Beitrag zur Kenntnis der Stellung des *Potentillo-Quercetum*. **[The position of the *Potentillo-Quercetum*.]** *Arch. Forstw.* 7 (9), 1958 (703–28). 43 refs. [G.g.russ.e.]

Summarizes researches on the composition and ecology of the *Potentillo albae-Quercetum* in Bohemia, particularly of the most commonly occurring form with *Galium sylvaticum*. These are regarded as mere relicts. The range (from W. Germany to the Urals and the *taiga*) and the sites of the forms of *Potentillo-Quercetum* are similarly discussed, and their relationship with other Oak forest associations is illustrated in association and area-spectrum tables.

4327. Hofmann, G. Die eibenreichen Waldgesellschaften Mitteldeutschlands. **[Central German forest associations rich in Yew.]** *Arch. Forstw.* 7 (6/7), 1958 (502–58). 19 refs. [G.g.russ.e.]

Describes, with association tables, their distribution, structure and floristic composition, sub-units, site factors, and phytogeography. The Yew is here a tree of the thermophilous Beech forests on limestone, with its optimum in the *Seslerio-Taxetum* (2 subassociations), regarded as a N.E. outlier of the *Taxo-Fagetum* and as a regional association. The tree occurs in almost all the *Cephalanthero-Fagetum* but more seldom in two other *Fageta*, one *Aceretum* and one *Quercetum* that are described.

4328. Bednarek, A. Zespoły leśne rezerwatu Lipka. **[Forest associations in the Lipka reserve.]** *Zesz. nauk. Szkoł. Gospod. wiejsk. Warsz.* (*Leśn.*) No. 1, 1958 (43–72). 24 refs. [Pol.g.]

A detailed description of the flora and associations of the reserve. Two main associations are distinguished: the *Querceto-Carpinetum medioeuropaeum* and the *Pineto-Quercetum*.

4329. Matuszkiewicz, A. Materiały do fitosocjologicznej systematyki buczyn i pokrewnych zespołów (związek *Fagion*) w Polsce. **[The classification of the *Fagion* communities in Poland.]** *Acta Soc. Bot. Polon.* 27 (4), 1958 (675–725 + 3 tbls.) 85 refs. [Pol.pol.g.] O.B.D.

A critical revision of the Beech and Sycamore Maple forests of the *Fagion* alliance. The following preliminary classification of associations is presented: (1) *Melico-Fagetum*—(*a*) Baltic (typical) faciation; (*b*) Sudeten faciation; (2) *Fagetum carpaticum*—(*a*) *F. carpaticum montanum*, (*b*) *F. carpaticum collinum*; (3) *Phyllitido-Aceretum*.

4330. Corti, R. Esiste una vegetazione mediterranea montana? **[Is there a montane Mediterranean vegetation?]** *Ann. Accad. ital. Sci. for.* 7, 1958 (61–86). 58 refs. [It.f.]

Critically examines different theories on the montane flora of the Mediterranean basin, with particular reference to *Quercus* and *Pinus* spp. [Cf. Rikli, *F.A.* 6 pp. 1–3.]

4331. Kornaś, J. Succession régressive de la végétation de garrigue sur calcaires compacts dans la Montagne de la Gardiole près de Montpellier. **[Stages in the regression of the garrigue vegetation on compact limestone soils on the Montagne de la Gardiole, near Montpellier.]** *Acta Soc. Bot. Polon.* 27 (4), 1958 (563–96 + 8 photos, 3 tbls.). 19 refs. [F.pol.] O.B.D.

Presents a study of the soils and vegetation of the garrigue in this region, and traces the stages in the regression (caused by destructive human agency) from the original *Quercetum ilicis*. It is important to conserve vestiges of the original vegetation and of the *Cocciferetum*, the next stage in the vegetation regression, and to re-establish the original species wherever possible.

4332. Barreto, R. R. Dantas. Os carvalhais da Serra da Peneda—estudo fitosociológico. **[The Oak forests of the Serra de Peneda—an ecological study.]** *Agron. lusit.* 20 (2), 1958 (83–153 + 3 plates, 4 tbls.). 37 refs. [Port.f.]

Describes the climate, soils, and vegetation of the Peneda range in the extreme north of Portugal, with particular reference to the Oak forests. Two Oak subassociations are recognized: (1) *Rusceto-Quercetum roboris ericetosum*, and (2) *Myrtilleto-Quercetum roboris myrtilletosum*. (1) Is found between 440 and 800 m. alt. and on the warmest aspects. It is distinguished by the presence of *Erica arborea*, *Cytisus striatus* var. *eriocarpus* and *Acer pseudoplatanus*. The associated climate is mesothermic, characterized by a very rainy period from September to May and a dry summer period. (2) Is found on slopes between 800 and 1150 m. and corresponds to a very rainy and temperate Atlantic climate.

4333. Vjekoslav. O šumi poljskog jasena sa kasnim drijemovcem (*Leucoieto-Fraxinetum angustifoliae* ass. nov.). **[*Fraxinus angustifolia*/*Leucojum aestivum* woodland (*Leucoieto-Fraxinetum angustifoliae* ass. nov.).]** *Šum. List* 83 (1/3), 1959 (39–45 + 1 tbl.). 13 refs. [Croat.g.]

Shows the floristic composition and describes the systematic position of a flood-plain woodland association, described here for the first time. It occurs in the Sava valley in hollows waterlogged for long periods, and is of value for indicating the division between Oak and Ash sites near the Sava.

4334. Paşcovschi, S., and Leandru, V. Tipuri de pădure din Republica Populară Romînă. **[Rumanian forest types.]** [*Publ.*] *Inst. Cerc. silv., Bucureşti* (*Ser. a II-a*) No. 14, 1958. pp. 458. 175 refs. [Rum.russ.g.]

Part 1 (ca. 90 pp.) is a general discussion of the bases of forest typology, with particular reference to Russian and Finnish literature. Part 2 gives detailed descriptions of Rumanian forest types, with a discussion of the relation of forest types to site types, graphic methods of representing vegetation types etc.

4335. Tatewaki, M. **Geobotanical studies on the Kurile Islands.** *Meddelanden från Göteborgs Botaniska Trädgård* (*Acta Horti Gotoburgensis*), *Göteborg* 21, 1957 (44–123 + 14 plates). 86 refs. [E.] E.M.B.

Includes sections on the forest communities and their distribution through the islands and a table showing the distribution of plant species by families.

4336. Taniguti, M. **[Phytological study of the South Shima Peninsula, Mie Pref.]** *Acta Phytotaxonomica et Geobotanica, Kyoto* 17 (5), 1958 (155–60 + map). [Jap.e.] From *abstr.* in *Biol. Abstr.* 33 (4), 1959 (No. 12712).

Communities discussed are *Shiia sieboldii*, *Machilus thunbergii* and *Quercus phillyraeoides* climax forests, and *Pinus thunbergii* and *Q. serrata* secondary forests.

4337. Brink, V. C. **A directional change in the subalpine forest-heath ecotone in Garibaldi Park, British Columbia.** *Ecology* 40 (1), 1959 (10–6). 29 refs.

Small trees of *Abies lasiocarpa* and *Tsuga mertensiana* have been observed invading heathland adjoining the upper subalpine forests and groves at 5000–6000 ft. alt. Ring counts, though not reliable, suggest that most of them were established 20–40 years ago, generally on sites that were early free from snow. The change is attributed to a recent climatic shift, apparent also in the retreat of glaciers, which resulted in a reduction of both depth and duration of snow cover.

4338. Bourdeau, P. F., and Oosting, H. J. **The maritime Live Oak forest in North Carolina.** *Ecology* 40 (1), 1959 (148–52). 6 refs.

Studies of structure and vegetation in 17 stands showed them to be composed up to 62% (in b.a.) of *Quercus virginiana*, to be more or less even-aged, and many centuries old. Though seedlings were numerous, saplings were rare. The forest had had very little effect on soil development in the coastal dunes. *From authors' summary.*

4339. Loveless, C. M. **A study of the vegetation in the Florida Everglades.** *Ecology* 40 (1), 1959 (1–9). 13 refs.

Describes the plant communities of the Upper Everglades region, including those of the characteristic, slightly elevated tree islands, discussing theories as to their origin and development, and the effect of fires on soil and vegetation.

4340. Champsoloix, R. À propos de la 'forêt claire' du sud-est asiatique. **[The 'woodlands' of S.E. Asia.]** *Bois For. Trop.* No. 64, 1959 (3–11). [F.e.span.]

Discusses the application of the terms defined at Yangambi [cf. *F.A.* 19 No. 2851] to the vast areas in S.E. Asia, where the 'forêt claire' consists of woodland without continuous canopy, over grass. The author holds that this type is related to defective soil drainage under a tropical climate characterized by a long, severe dry season, and the constant presence of some tropophilous social species (usually dipterocarps).

4341. Koelmeyer, K. O. **Climatic classification and the distribution of vegetation in Ceylon.** *Ceylon For.* (*n.s.*) 3 (2), 1957 (144–63).

A study of the extent to which several existing classifications (Thornthwaite's, Köppen's, and Swain's) could establish the climatic limits of the distribution of vegetation in Ceylon [cf. *F.A.* 14 No. 2976]. The application of Transeau's precipitation/evaporation ratio is also discussed.

4342. Gilliland, H. B. **Plant communities on Singapore Island.** *Gdns'. Bull.* 17 (1), 1958 (82–90). 5 refs.

Analyses various stages of second-growth (*belukar*) forest and deduces the probable successional trends if a change of climate took place.

4343. Wyatt-Smith, J. **Peat-swamp forest in Malaya.** *Malay. Forester* 22 (1), 1959 (5–32). 22 refs.

Existing information on peat-swamp forest in

Malaya has been brought together. The forest of these swamps is shown to contain not only economically valuable timber species but also an excellent representation of most of these species in all the smaller size-classes, thereby facilitating silvicultural treatment and giving promise of an even more valuable crop to come. The future of the west-coast peat-swamp forests overlying clay, which are mainly reserved forest, is discussed, there being continued pressure to release some of them for agriculture. *From author's summary.*

4344. CLAYTON, W. D. **A tropical moor forest in Nigeria**. *J. W. Afr. Sci. Ass.* 4 (1), 1958 (1–3). 4 refs. H.S.B.

Describes a swamp forest, dominated by *Ficus umbellata*, *Syzygium guineense* var. *guineense*, *Voacanga obtusa* and *Cleistopholis patens*, and developed over a lens-shaped peat body (cf. raised bogs of temperate climates), the origin of which is ascribed to waterlogging, mineral deficiency, and freedom from disturbance, the last factor rare in Africa and the possible reason for the lack of reports of such forests there.

4345. KILLICK, H. J. **The ecological relationships of certain plants in the forest and savanna of central Nigeria**. *J. Ecol.* 47 (1), 1959 (115–27 + 1 plate).

This paper is the botanical report of an expedition to Dogon Kurmi, near Jos in central Nigeria, in August 1955, with comments on the soil and fauna. Seedlings of 22 species of both forest and savanna type were examined, to throw light on whether forest plants were invading the 'derived' savanna or whether the reverse was true. The trees in the forest attain a height of 20 or even 40 m., in the savanna about 5 m.; at Dogon Kurmi the forest and savanna are found together and intergrading. When studied in the wet season, the savanna grasses stood 1–2 m. high; in the dry season their culms are fired. Fifteen transects, from six different situations, covered both gradual and abrupt transitions from *kurmi* to savanna in varying soils and also pure savanna and pure stands of *Uapaca togoensis*. These were mapped showing old and young plants of the selected species and the extent of every tree's shade. The relative 'success' of a given species in differing conditions of shade and firing was estimated, using numbers and height as a criterion. The need to choose common and easily identifiable species and for complete mapping, curtailed work on the high forest; in practice also, seedlings were often not distinguishable from suckers or fired saplings. Analysis of the 22 species (16 are individually discussed) show 3 to be randomly dispersed by wind, and 5, for various reasons, clumped. Middle-sized trees of 5 species are scarce; in 2 of these the heavy seeds which fall to the ground almost entirely fail to germinate. Five fire-tolerant species attain a larger size in open situations; of apparent shade-lovers, 4 are limited more by fire and one by its mode of dispersal. Edaphic factors only occasionally influence the distribution of forest and savanna plants, though 5 plants show weak correlation with clay content and only one tolerates soils of small effective depth. Though some shrubs and climbers may protect trees against fire, *Uapaca* alone of such trees helps forest trees to grow under it; there is little to suggest that the forest is encroaching on the savanna, and the reverse is happening in one transect. *Author's summary.*

4346. ÉVRARD, C. L'association à *Aneulophus africanus* Benth., forêt périodiquement inondée sur podzol humique au Congo Belge. **[The *A. africanus* association, periodically flooded forest on a humus podzol in the Belgian Congo.]** *Bull. Jard. bot. Brux.* 27 (2), 1957 (335–49). 10 refs. [F.] O.B.D.

Discusses the composition, microclimate, soils, hydrology and ecological classification of an unusual forest association in the region of Yangambi.

4347. LIBEN, L. Esquisse d'une limite phytogéographique guinéo-zambézienne au Katanga occidental. **[A Guineo-Zambesian phytogeographical boundary in western Katanga.]** *Bull. Jard. bot. Brux.* 28 (3), 1958 (299–305). 9 refs. [F.] O.B.D.

Western Katanga is situated in the Sudano-Zambesian region and bounded in the north by the transitional district of Lomami, which has hitherto been placed in the Guinean region. The southern part of this district, however, is transitional between the Guinean and Zambesian types and should be distinguished from the northern part which is definitely Guinean. The former is characterized by savannas of a Guineo-Zambesian type, Peri-Guinean gallery forests, and tropophilous forests characterized by *Berlinia giorgii* and *Uapaca nitida*. These forests have a definitely Zambesian character (although containing some Guinean or transitional species), and it is proposed to make their northern limit the boundary between the Guinean region and the Zambesian domain [cf. *F.A.* 19 No. 4005].

4348. LIMA, R. RODRIGUES. Aspectos fisiográficos da região amazônica. **[Physiographic aspects of the Amazonian region.]** *An. bras. Econ. flor., Inst. nac. Pinho* 10, 1958 (307–17). [Port.]

In the region of the Amazon estuary 4 main vegetation types can be distinguished: (1) '*várzea*'—areas of forest periodically flooded by the river waters, (2) '*terra firme*'—areas out of reach of the flood-waters, (3) '*igapó*'—permanently flooded forest areas (when devoid of woody vegetation such areas are known as '*lagos*'), and (4) '*campo*'—areas carrying grasses or herbaceous plants, with or without scattered trees. The characteristics of these communities, particularly of (1), are described and the agricultural potentialities of such areas discussed.

4349. ELLENBERG, H. Typen tropischer Urwälder in Peru. **[Types of tropical virgin forests in Peru.]** *Schweiz. Z. Forstw.* 110 (3), 1959 (169–86). 6 refs. [G.g.f.]

A description of their structure, with special reference to the lowland forests of the Amazon basin, based on a study tour. Classification largely follows that of Beard [cf. *F.A.* 16 No. 2813]. In the tropical rain forest which covers a large part of the area, 6 main edaphic groups are distinguished. The author noted in particular an absence of epiphytes and undergrowth in undisturbed forest in contrast to the very dense undergrowth, lianas etc. in secondary forests following shifting cultivation or in forests disturbed by charcoal burning or selective logging. All steppe- or savanna-type vegetation is thought to be of anthropogenous origin.

4350. TAMAYO, F. Notas explicativas del Ensayo de Mapa Fitogeográfico de Venezuela (1955). **[Notes explaining the Phytogeographical Map of Venezuela (1955).]** *Rev. for. venez.* 1 (1), 1958 (7–31 + 3 maps). 9 refs. [Span.]

Notes and illustrations of the 9 phytogeographical formations of Venezuela, with political, physical and phytogeographical maps (all 1:4,635,000).

4351. HADLEY, C. J. **The Kauri [*Agathis macrophylla*] forests of the Santa Cruz Islands.** *J. Oxf. Univ. For. Soc.* (*Ser. 5*) No. 7, 1959 (11–5).

2. SILVICULTURE

See also Nos. 4210, 4212, 4214–6, 4232, 4234 *et seq.*

4352. JUSTICE, J. **A dissertation on the culture of forest trees.** *Bull. For. Dep. Univ. Edinb.* No. 6, 1959. pp. 36.

A treatise first published in 1759 by a Scottish landowner and horticulturist, republished both for its intrinsic merit and for its historical interest, particularly the insight it gives into the experimental method of the period, its interest in exotics, etc.

4353. HILEY, W. E. **Conifers: South African methods of cultivation.** Faber & Faber, London. 1959. pp. 123 + 21 photos. 28 refs. Price 21*s.*

The author, who visited S. Africa in 1947 and again in 1957, describes the standardized methods of wide-spaced cultivation and numerical thinnings practised there on the basis of Craib's theories [cf. *F.A.* 19 No. 816], the C.C.T. plots laid out by O'Connor [cf. *F.A.* 19 No. 422], species used, utilization, etc. He is convinced that these methods have proved themselves economically in S. Africa and urges their adoption, suitably adapted, in Great Britain.

4354. WILLAN, R. G. M. **120th annual meeting of the British Association for the Advancement of Science at Glasgow from 27th August to 3rd September 1958.** *Emp. For. Rev.* 37 (4), 1958 (442–9).

Includes a report of the following papers: The native Pinewoods of Scotland and their significance for current forestry practice (*H. M. Steven*) [cf. *F.A.* 20 No. 2960]; The genetical quality of forest tree seed (*J. D. Matthews*); Assessments and improvement of the sowing value of seeds (*G. D. Holmes*); The value of improved seed and quality control in field practice (*J. R. Thom*); The management of fast-grown conifers with particular reference to Western Scotland (*A. Watt*); The relation between rate of growth and timber quality (*B. J. Rendle*); and The utilization of fast-grown coniferous timber in the sawmilling industry (*R. F. Wilson*).

4355. FLÖHR, W. Waldbauliche Richtlinien für die Bewirtschaftung der Wälder im mecklenburgischen Grund- und Endmoränengebiet. **[Correct silviculture for the management of the forest of the ground- and end-moraine region of Mecklenburg.]** *Arch. Forstw.* 8 (2), 1959 (85–160). 67 refs. [G.g. russ.e.]

The production of the various sites (mainly sands and loams, some influenced by groundwater) is compared with that on comparable sites at Eberswalde and with yield tables, from data collected from 347 stands and 5 permanent sample plots, comprising Beech, Oak, Red Oak, Ash, Scots Pine, Spruce, European and Japanese Larch, Douglas and Silver Fir, Sycamore and Norway Maple, Elm, Birch, Weymouth Pine, Sitka Spruce and Western Hemlock. The relation of volume to mean stand height is plotted for the first 10 species. The growth of all species was preponderatingly above the mean of the yield-table quality class, with the stand b.a. of Oak and Spruce of comparable quality class above the table means. Surprisingly good growth is shown in Silver Fir (outside its natural range and with an annual rainfall of only 580 mm. compared with a stated minimum requirement of 700). Japanese Larch growth is also above expectation. Pine, Spruce, Larch, Douglas, Beech, Sessile Oak, Red Oak, Ash, Alder, Birch and Poplar are then each considered as a main species choice for various sites, with recommended mixtures and/or under-planting under various 'growing-stock objective types' [see *F.A.* 17 No. 3153]. The regeneration (artificial and natural) of Beech and of the other species, production objectives for the species, and the injuries to which the crops are liable are discussed. The depressing effect of wind (W. and S.W.) on height growth, and damage by deer are important.

4356. BORCHERS. Die Harzfichtenwirtschaft —Rückblick und Zielsetzungen. **[Management of Spruce in the Harz mountains: past and future.]** *Allg. Forstzeitschr.* 14 (15), 1959 (301–6). 36 refs. [G.]

Discusses chiefly the origins of present stands, few of which are thought to contain local (climatically adapted) races, and the incidence of snow and ice damage (danger zones in relation to age groups, stand structure, etc.). Selection-type forests are not recommended for the future.

4357. EUSTATHIADES, S. Hē sēmasia tēs kastaneas hōs dasikou dendrou en Helladi. **[The importance of the Chestnut [*Castanea sativa*] as a forest tree in Greece.]** *Das. Chron.* 1 (3), 1959 (123–4). [Gk.]

A plea for more rational exploitation of Sweet Chestnut which, apart from the Mt. Athos demonstration forest, totals 283,000 stremmas or ca. 1½% of Greece's total forest area. Data from the Mt. Athos forest indicate that a [mean?] annual increment of 1 cu.m./stremma may be expected. So far *Endothia parasitica* has not been reported in Greece.

4358. HOUGH, A. F. **Zoning for the management of Black Cherry on the Allegheny Plateau.** *J. For.* 57 (5), 1959 (353–7). 26 refs.

Zones below elevations at which glaze-storm damage to *Prunus serotina* saplings and small poles is serious are classed as most desirable, unless they fall in the mixed Oak, Aspen, Pin Cherry, or Hemlock forest types. Some 702,000 acres in the Allegheny National Forest were zoned in detail, 59% of the total area being in the zone most favourable for continued *P. serotina* production. A brief review of recommendations for the intensive management of *P. serotina* is given, covering physiographic location, site, soils, felling system, species composition, cultural practices, and protection.

22. Silvicultural Systems. Constitution and Composition of Stands; Forms of Stand

221. High Forest Systems

See also Nos. 4100–2, 4252, 4313, 4325, 4385, 4391, 4568, 4627.

4359. TRAPPE, J. M. **Lodgepole Pine clearcuts in northeastern Oregon.** *J. For.* 57 (6), 1959 (420–3). 6 refs.

On 8 clear-felled areas examined, soil disturbance covered 2–8% of the ground surface, depending on felling and skidding methods. Ca. 40% of the ground surface was covered by slash, $\frac{3}{4}$ of it being < 1 ft. deep. Of the scattered residual Lodgepole, long-crowned stems of 6–12 in. d.b.h. were most windfirm. Advance regeneration (including Douglas Fir, Grand Fir, and Western Larch) contributed materially in forming the new stand, and areas of regeneration were generally too densely stocked. In general, shrubs decreased and forbs increased after clear felling. Recommendations are made on timing the fellings, the size and shape of clear fellings, slash treatment, residual trees, and forage improvement.

4360. WEBB, L. S. **The results to date of the clear cutting experiment of 1948.** *For. Res. Note Causapscal For. Res. Sta.* No. 8, 1958. pp. 6.

Describes the original stocking and structure of 4 stands of ca. 47 acres (predominantly even-aged Balsam Fir resulting from a windthrow in 1883), the yield at felling and the development of the reproduction. The number of seedlings per acre declined sharply at first from 32,000 to 2320, and was 2450 in 1957. Saplings, after a first decline from the original 1760, rose to 6960. The impression then was of a fine stand of Balsam up to 8 ft. high, with scattered White Birch.

4361. HATCHER, R. J. **Partial cutting with diameter limit control in the Lake Edward Experimental Forest, Quebec, 1950 to 1956 (Project Q–44).** *Pulp Paper Mag. Can.* 60 (Convention No.), 1959 (246 . . . 254). 5 refs.

Partial fellings of Spruce (mainly *Picea rubens*), *Abies balsamea* and *Betula lutea* with lower diameter limits of 16, 8 and 16 in. respectively, at a stump height of 1 ft. have been carried out successfully on a commercial basis. Although it was not difficult to convert the fellers from clear felling to partial felling, the amount of infringement varied inversely with the degree of supervision.

4362. **Intensive management improves growth and growing stock.** *Rep. Ntheast. For. Exp. Sta. 1958*, 1959 (21–2).

Five-acre comparable plots of 40- to 45-year second-growth Appalachian hardwoods at the Fernow Experimental Forest were put under 4 systems of management. After 10 years, net m.a.i. was highest on the most intensively managed plot, viz. selective fellings on a 5-year cycle.

4363. MILAS, B. Gospodarenje pojedinim vrstama drveća u prebornoj šumi. **[The management of individual species in selection forest.]** *Šum. List* 83 (1/3), 1959 (1–25). [Croat.croat.g.]

Examines data from an enumeration of all stems of > 10 cm. d.b.h. in selection forests of Gorski Kotor and northern Velebit, the principal selection-forest area of Croatia, making recommendations on the species mixtures of the 7 forest types studied.

4364. GOMES, A. M. DE AZEVEDO, and COUTINHO, F. M. C. B. NOBRE. Pinhais jardinados—algumas considerações teóricas e um exemplo. **[Pine selection forest—some theoretical considerations and an example.]** Direcção Geral dos Serviços Florestais a Aqüícolas, Ministério da Economia, Lisbon. 1958. pp. 53. 13 refs. [Port.port.]

Discusses general theoretical aspects of the selection system and some associated problems, and describes the way in which these problems have or have not been solved in the *Pinus pinaster* forests of the Setubal Peninsula, making some suggestions for future practice.

222. Coppice, Pollarding and Lopping Systems

See also Nos. 4110, 4424, 4609.

4365. RISPOLI, E. Inchiesta sulla produzione e reddito dei boschi cedui nel Casertana. **[Yield and income from coppice in the province of Caserta.]** *Ital. for. mont.* 14 (2), 1959 (64–78). 7 refs. [It.it.f.]

On the basis of data from 5 groups of coppice woodland of different species, the author calculates that the periodic gross return over a 15-year period is Lire 77,208. The value of the products for pulp and particle-board manufacture are discussed.

226. Changes of Silvicultural System. Conversion (by System or Species)

See also Nos. 4851, 5037–8.

4366. ROISIN, P. La transformation des pessières. **[The conversion of Spruce forests.]** *Bull. Soc. for. Belg.* 66 (3), 1959 (153–90). [F.]

Discusses the climatic and pedological factors making conversions desirable in the greater part of the Belgian Ardennes, outlines the instructions for gradual conversions issued by the Belgian Forestry Administration in Nov. 1957, and, in illustration, describes the conversion plan for the communal forest of Tellin, near Rochefort, at 300–425 m. alt. The plan envisages conversion of ca. 100 ha. of pure Spruce to a mixture within the next 24 years, mostly by planting suitable species in existing or newly created openings of ca. 10 ares, and aims at a final composition of ca. 25% hardwoods (mostly Beech), 25% Douglas Fir, 20% Larches, and the rest chiefly Silver Fir, *Abies grandis*, and Spruce.

4367. MINCKLER, L. S., and RYKER, R. A. **Partial conversion of poor hardwood stands to conifers by planting**. *Tech. Pap. Cent. St. For. Exp. Sta.* No. 159, 1959. pp. 9.

From experiments in planting *Pinus echinata* and *Juniperus virginiana* in clear-felled, partially cleared, and untouched poor hardwood stands in the Kaskaskia Experimental Forest, S. Illinois, necessary conditions for success were seen to be: (1) confining planting to the poorest ridges and upper slopes where hardwoods grow slowly; (2) killing the hardwood brush with 2,4,5-T before planting (either the entire stand for total conversion, or creating openings of ≮ 1½–2 times the height of the overstorey for partial conversion). Subsequent release may be on a crop-tree basis, covering an area at least twice the height of competing hardwoods. Observations indicate that conifers should be released when competing hardwoods begin to shade the upper half of the crowns.

4368. WOODS, F. W. **Converting scrub Oak sandhills to Pine forests in Florida**. *J. For.* 57 (2), 1959 (117–9).

On scrub Oak and wiregrass sites in W. Florida, complete denudation of the site (bulldozing and root-raking) has resulted in 82% survival of planted Slash Pine after 3 years; furrow-planting 65; summer burning 54; harrowing 44; no treatment 40; and chemical control of Oaks 36% survival. Clearing operations should begin in late April or early May, and be repeated 6–8 weeks later. The Slash Pines should be planted in the first planting season after site clearance.

4369. WYATT-SMITH, J. **Development of a silvicultural system for the conversion of natural inland lowland evergreen rain forest of Malaya.** *Malay. Forester* 22 (2), 1959 (133–42). 6 refs.

A paper presented to the UNESCO Symposium on 'The Vegetation of the Humid Tropics', Bogor, Indonesia, Dec. 1958, stressing the importance of elasticity in any plan, to permit of alterations to meet changes brought about by management, which are likely to be greater and more frequent than when a stable forest estate has been attained and the second rotation reached.

4370. SCHUCKAR, H. Exploração racional das matas naturais. **[The rational exploitation of natural forest.]** *An. bras. Econ. flor., Inst. nac. Pinho* 10, 1958 (82–8). [Port.]

Reviews types of silvicultural treatment suitable and outlines plans for the forest reserves in the Cantareira mountains, São Paulo. Virgin forest will be transformed by a succession of selective fellings into a forest of greater homogeneity with a reduced number of species, those of commercial value being retained. The '*capolira*', an area of dead, decayed and deformed trees, with shrubby growth and weeds impeding natural regeneration will have the undergrowth cleared and the canopy opened, leaving seed trees to initiate natural regeneration. Later the seed trees will also be removed, leaving only a few individuals of commercial value. Very degraded areas will be clear felled and artificially regenerated.

228. Constitution and Composition of Stands; Choice of Species and Form of Mixture; Tree Classes; Forms of Stand

See also Nos. 4296–7, 4325, 4376, 4399, 4531–2, 4877, 4993, 5004, 5006–9, 5024–5.

4371. KUUSELA, K. Taimistojen taloudellinen kasvattaminen. **[Economic treatment of seedling and sapling stands.]** *Metsät. Aikak.* 1959 (1), (13–5). [Fi.e.]

The economic treatment of such stands must be based on the fact that only a limited number of trees can grow to more than the minimum commercial diameter. Each tree felled below this diameter increases the waste increment, causing expense without corresponding profit. A graph is given showing the division of gross increment into net and waste increment. It is assumed that in a normal Pine stand on a *Calluna* forest-site type only trees with d.b.h. ⩾ 21 cm. are commercially exploitable, and the increment accumulated in these trees is called the net increment; waste increment comprises all other trees, either dead or to be felled as an obstacle to logging and regeneration. To increase the net increment and accelerate stand development during the stage when net increment is smallest, the seedling and sapling stand should consist only of those trees that can reach the minimum exploitable diameter, plus a reserve to offset possible mortality. The economic number of seedlings and saplings is estimated at 1500–2000/ha., the permissible number increasing with improved site quality and market conditions. *From author's summary.*

4372. HOPKINS, W. C. **Relationship of stand characteristics to quality of Loblolly Pine**. *Bull. La. agric. Exp. Sta.* No. 517, 1958. pp. 57. 24 refs.

A statistical analysis, based on 195 temporary ⅓-acre plots in essentially single-storeyed stands of Loblolly and hardwoods of sawtimber size in Louisiana. The quality index of Pine (based principally on freedom from knots in the butt log) increased with age but was not significantly related either to present density, site index, or % of dominant hardwoods. Small amounts of subdominant hardwoods did however prove beneficial, the optimum being ca. 5% of the total b.a. of dominant hardwoods of a stand.

4373. BERNTSEN, C. M. **A look at Red Alder—pure, and in mixture with conifers**. *Proc. Soc. Amer. For.* 1958 (1959), (157–8).

Reports on test plots established in 1935–37 in mixed stands aged 8–12 years. In the control plots (1) there were ca. 3000 stems/acre; (2) was thinned to 2000 stems, and (3) to 733 stems/acre of pure Alder, and (4) to 1148 stems/acre of pure conifers (Sitka Spruce, Douglas Fir, and Western Hemlock). At 30 years, volumes and c.a.i. (in bd.

ft.) were respectively: 2900 and 260 for (1), ca. 3300 and 260 for (2) and (3), and 4300 and 400 for (4).

4374. TISSEVERASINGHE, A. E. K., and SATCHITHANANTHAN, S. **The management of Sundapola plantation.** *Ceylon For.* (*n.s.*) 3 (1), 1957 (82–93).
Describes and discusses what is known of the establishment, working plans and yield data of a 50-year-old mixed plantation of *Artocarpus integrifolius* and *Swietenia* sp.

4375. **[Virgin forests.]** *Schweiz. Z. Forstw.* 110 (3), 1959 (111–97 + 12 plates). 80 refs. [G. or F., f. or g.]
A special number, including the following papers, with illustrations: Analysis of structure and increment in virgin forests, its aims and methods (*H. Leibundgut*) [discussing methods and classifications of trees and development phases etc. employed in investigations in Slovakia and Jugoslavia (to be published later)]; The northern virgin forests (*R. Sarvas*) [describing the main Finnish types]; Research in virgin forests as a basis of a more natural silviculture, discussed on the example of the East Canadian conifer forests (*P.-E. Vézina*); The Fir forests of the St. Laurent basin (*J. N. Köstler*); Virgin forests in Jugoslavia (*K. Pintarič*) [describing mixed stands of Silver Fir, Beech and Spruce in Slovenia and Bosnia, with some data on regeneration and increment; cf. *F.A.* 19 No. 4617]; Types of tropical virgin forests in Peru (*H. Ellenberg*) [see F.A. 20 No. 4349]; and Silvicultural research in tropical virgin forest (*H. Lamprecht*) [discussing chiefly methods and aims on the basis of the author's experiences in Venezuela].

23. Regeneration and Formation of Stands

See also No. 5004.

231. Natural Regeneration

See also Nos. 4119, 4287, 4291–2, 4313, 4359–60, 4534, 5452.

4376. **[Natural regeneration in Czechoslovakia and adjoining regions.]** *Sborn. čsl. Akad. zeměd.* (*Lesn.*) 5 (2), 1959 (107–252). Many refs. [Cz. or Slovak.russ.g.]
Papers delivered at a conference, with the theme 'Biological bases of natural regeneration in the forest', held in Czechoslovakia in July 1958: Composition, constitution and regeneration of natural forests of the Ukraine Carpathians (*F. Korsuň*); Stand structure, and natural regeneration of the principal species, in the Boubín virgin forest (*J. Řehák*); Analysis of natural regeneration of Beech in old stands in the Voděrad Beech Forest Nature Reserve (*R. Čvančara* and *V. Samek*); Composition and spacing in the Lanžhot natural forest [a 3-storeyed, mixed, broadleaved forest], and the natural regeneration there (*M. Vyskot*); Preliminary results of Silver Fir regeneration investigations (*B. Vinš*) [on the causes of failure of natural (and artificial) regeneration]; Silver Fir from the standpoint of typology (*D. Randuška*); The conditions of natural regeneration according to forest-type groups (*J. Pitko*); Natural regeneration of *Abies alba* in the Mionší natural forest reserve in the Moravian-Silesian Beskyds (*J. Chemlař*); The possibilities of natural regeneration in the forest types of the Banská Štiavnica forest district (*L. Hančinský*); Efforts at natural regeneration and the origin of the first forest reserves (*J. Nožička*).

4377. HANČINSKÝ, L. Príspevok k posúdeniu prírodzenej obnovy v porastoch pod'la lesných typov LZ B. Štiavnica. **[Natural regeenration of some species in the forest types at Banská Štiavnica.]** *Lesn. Čas.* 5 (1), 1959 (3–18). [Slovak.russ.g.]
Analyses the numbers and relative proportions of regeneration of Beech, Oak, Silver Fir, Hornbeam and other broadleaved species in the various types of the *Querceto-Fagetum* of Slovakia.

4378. KÜNZEL. Zum Tannenproblem aus dem Ostschwarzwald und der Baar. **[The Silver Fir problem in the Eastern Black Forest and Baar region [S. Baden].]** *Allg. Forstzeitschr.* 14 (17), 1959 (336–7). 4 refs. [G.]
The author maintains that the existing Silver Fir of this region, where this species cannot now be regenerated without fencing, originated at a period when, as old shooting records show, roe-deer densities were often as high as they are today. Under the longer regeneration periods then used for both pure and mixed stands (30–70 compared with 20 years or clear felling) regeneration areas were larger and browsing consequently less concentrated and harmful.

4379. MACLEAN, D. W. **Five-year progress report on Project RC-17.** *Woodl. Res. Index Pulp Pap. Res. Inst. Can.* No. 112, 1959. pp. xii + 142. 28 refs.
[Cf. *F.A.* 17 No. 3777.] Conclusions to date are that: scarification of the seedbed with a root-rake is an effective method of encouraging softwood regeneration, particularly that of Spruce; spraying with herbicides has not helped seedbed conditions, and should be limited to release of established seedlings; the maximum width of clear-felled strip still allowing satisfactory seeding from adjacent uncut areas would appear to be ca. 3 chains.

4380. NICKERSON, D. E. **Studies of regeneration on burnt forest land in Newfoundland [with discussion].** *Publication, Newfoundland Research Committee, St. John's* No. 1, 1958 (11–8, 62–4).
Describes detailed studies of soil conditions etc. on recent burns, and extensive reproduction studies on cut-over areas where stands, apparently of post-fire origin, had been harvested. Of 22,000 acres of productive forest lands recently burned, 6000 carried satisfactory regeneration, mainly Black Spruce. No regeneration occurred from seed stored in the duff; it depended on seed supply after the burn plus a suitable seedbed, weather, etc. Thus for Birch this implied the presence of Birch in adjacent stands. Balsam Fir regeneration was rare, mature seed being present only in the late summer of seed-years after fires that did not consume the whole crown. Black Spruce regenerated freely if 10–15 fire-killed mature trees, carrying 200–400 cones near the top, were standing per acre, but not in young or scrubby stands or stands clear cut for pulp. It is

suggested that the leaving of seed trees, followed by slash burning might be a suitable method of assuring Black Spruce regeneration.

4381. CHROSCIEWICZ, Z. **Controlled burning experiments on Jack Pine sites.** *Tech. Note For. Br. Can.* No. 72, 1959. pp. 19. 23 refs.

Since Jack Pine maintains itself and spreads mainly through the occurrence of forest fires, experiments were carried between 1949 and 1956 with a view to developing methods of regenerating this species by controlled burning. Experiments included burning slash, burning an open stand, direct sowing after burning slash, burning individual trees (in order to release seed from cones), and burning slash on a site with seed-trees. Details are given of all experiments, including methods of starting and controlling burns, suitable weather etc. Burning cannot be regarded as a dependable method of releasing seed from cones in slash, because the fire either destroys the seed or greatly reduces its viability. The success of opening cones on seed-trees by means of slash fires depends largely on the intensity of the fire: a good head-fire may open all cones on seed-trees, or twice as many as an average back-fire. Lowest costs/acre are achieved when fairly large areas are burned in the evening.

4382. AHLGREN, C. E. **Some effects of fire on forest reproduction in northeastern Minnesota.** *J. For.* 57 (3), 1959 (194–200). 16 refs.

A six-year study, based on > 350 plots covering both wild and prescribed burns, showed that Jack Pine, Black Spruce, Aspen, Birch, etc. all regenerated vigorously on burned areas, but that the time of germination and the optimum conditions for growth varied between species. Fire stimulated Jack Pine germination, and improved seedbed conditions by reducing the depth of the organic layer. The minerals in the ash stimulated the growth of a lush herbaceous cover. There were some indications that ash concentrations on the surface inhibited Black Spruce germination, but this inhibition disappeared after one year. Burning did not seriously reduce the mineral nutrients in the soil, at least for 5 years after the fire.

4383. MUELDER, D. W. **Contributions to a better understanding of the process of natural reproduction in California.** *Proc. Soc. Amer. For.* 1958 (1959), (148–50).

A study of survival of Ponderosa Pine natural regeneration in an area logged 30–50 years ago, in relation to micro-site condition, ground vegetation, shade, etc. on the one hand and precipitation in the growing season on the other. Under certain conditions, seedlings survived in a state of extremely reduced activity.

4384. GODMAN, R. M. **Are water table levels an important factor in the establishment and growth of Yellow Birch?** *Pap. Mich. Acad. Sci.* 44, 1958 (1959), (183–90). 9 refs. L.S.

In 1954–55, wells 3–6 ft. deep were dug in 5 different stands of 3 forest cover types in the Upper Peninsula Forest, Mich., and records kept for 3 years of water-table fluctuations. Under the mixed coniferous swamp type, the water level remained near the ground surface throughout most of the growing season and showed relatively little change. Under almost pure Sugar Maple with very little Birch, the level was commonly lower than 4½ ft. In Hemlock/Yellow-Birch associations, groundwater levels were intermediate in depth between the above types, but varied with the degree of cutting and topographic position. In an earlier study on natural regeneration [see *F.A.* 19 No. 1583], it was seen that on undisked areas Birch seedlings could only compete with the thick herbaceous cover in low-lying areas having a high water table. The influence of water-table levels on diam. growth was further shown on two plots cut by the group selection method. The mean diam. growth over 5 years was 0·2 in. higher on a plot with a water table varying from 0 to 5 ft. below surface during most of the growing season than on a plot where it averaged > 15 ft., even though stocking between the openings was slightly less on the latter. The possible relationship between extended periods of high water-table levels, and top-dying of Birch is discussed briefly.

4385. MINCKLER, L. S., and JENSEN, C. E. **Reproduction of upland central hardwoods as affected by cutting, topography, and litter depth.** *J. For.* 57 (6), 1959 (424–8). 3 refs.

A statistically tested survey of regeneration was made on 7 blocks of mixed hardwoods and 3 blocks of Oak/Hickory type (total ca. 200 acres, S. Illinois), 4 years after a combined harvest and improvement felling. On all 10 areas (both moist and dry) there was an average of > 3000 well distributed seedlings of desirable species per acre; on moist sites there were also 1200 seedlings/acre of undesirable timber species and 1800 seedlings/acre of non-timber species; on drier sites 400 seedlings/acre of undesirable species and 1300 seedlings/acre of non-timber species. Regeneration of Oaks and Hickories was better on middle and upper slopes and on ridge-tops, of Tulip Tree on lower N. slopes. In general, more regeneration was found on plots with the thinnest litter, but Oaks regenerated just as well on plots with 1 in. of litter, and thicker litter reduced Oak regeneration only slightly, as was also the case with Hickory on drier sites. Tulip Tree required felled openings, seed trees in the overstorey, and seedbed with bare soil or only thin litter, and little brush. Tulip Tree and the Oaks had more regeneration in openings than under the canopy, and all species grew faster in the openings. Normally, the species composition of stands from this regeneration will be satisfactory, but some stands on the moister sites will require special treatment, especially if a high % of Tulip Tree is to be obtained.

4386. CARVELL, K. L., and TRYON, E. H. **Herbaceous vegetation and shrubs characteristic of Oak sites in West Virginia.** *Castanea* 24 (1), 1959 (39–43).

In a study of plots in 69 stands, regeneration of Oak (*Quercus rubra* and *Q. alba*) was found to be most abundant on dry sites of the middle and upper third of slopes, where *Vaccinium* spp. and *Gaylussacia baccata* were characteristic species. It was least abundant on moist sites with a ground cover of ferns and/or dense herbaceous growth depriving Oak seedlings of light.

4387. HOLMES, C. H. **The natural regeneration of the wet and dry evergreen forests of Ceylon.** *Ceylon For.* (*n.s.*) 2 (4), 1956 (151–64); 3 (1; 2), 1957 (15–41; 111–27). 12 refs.

Contains chapters on: (1) general state of knowledge; (2) foliar changes, flowering, fruiting and seed germination; (3) investigations carried out in experimental garden trials; (4) and (5) field investigations on special problems of natural regeneration in dry and wet evergreen forests respectively, with special reference to the removal of unwanted species, particularly *Ficus* spp. and *Ochlandra stridula.*

4388. TISSEVERASINGHE, A. E. K. **The natural regeneration of Jak [*Artocarpus integrifolia*].** *Ceylon For.* (*n.s.*) 3 (2), 1957 (171–3). 3 refs.

Preliminary investigations indicate that the supposed inability of Jak to regenerate naturally in plantations is due to browsing by cattle and hares.

4389. **[Encouraging natural regeneration of valuable species.]** *Rep. Dep. For. Qd. 1957/58*, 1958 (9).

Experiments in the preparation of a seedbed round parent trees of *Flindersia brayleyana*, *F. bourjotiana* and *Cedrela australis* have been very successful. Weed species were cut to a radius of 1 chain, and the debris raked into heaps, just before seed-fall, round trees of excellent development bearing a reasonably good seed drop. It is intended to extend this work to embrace all Group-A species.

232. Artificial Regeneration

4390. *Pinus merkusii* Jungh et de Vriese: caractères sylvicoles et méthodes de plantation. **[*P. merkusii*: silvicultural characters and plantation technique.]** *Bois For. Trop.* No. 64, 1959 (19–24). [F.]

4391. WEISS, J. Kiefernachzucht auf Kleinflächen und unter Schirm. **[Regeneration of Pine on small areas or under shelter.]** *Allg. Forstzeitschr.* 14 (25), 1959 (460–4). 4 refs. [G.g.]

Summarizes results of regeneration by sowing or planting, in the gaps resulting from the 'single-tree' management system (*Dauerwald*) favoured by Wiebecke in Eberswalde ca. 30 years ago. Of 90 such gaps investigated, varying from 0·01 to 1·2 ha., 47 were adequately stocked, including 14 fully stocked and with many well formed trees. Success was related to gap size (the minimum successful size being ca. 0·25 ha.), site (the poorer sands, particularly on dunes, being generally best), and treatment (particularly in relation to hardwood competition).

4392. BUTLER Y ORBETA, J. M. Cuencas de los pantanos de Gabriel y Galán y del Borbollón, Las Hurdes. **[The valleys of the swamp lands of Gabriel y Galán and of Borbollón, Las Hurdes.]** *Montes, Madrid* 15 (85), 1959 (35–44). [Span.]

Presents a report on the work of the State Forest Service since 1941 in this remote and undeveloped region on the northern limit of the province of Cáceres. In general *Pinus pinaster* was sown direct in alternate strips along the contour of the valley slopes, the intervening strips being left uncultivated. On slopes above 1100 m., *P. sylvestris* was planted. Progress is reported on 5 areas where forest land has been taken over by the State and information is given on the area taken over, plants raised, area afforested, and on the installation of roads, telephones and houses for forest guards.

232.1. Choice and Trial of Species, Races etc.

232.11. Species Trials, including Forest Gardens, Trials of Exotics etc.

See also Nos. 4518–9, 4521–3, 4526.

4393. MODERT, P. Les sapins de Juckelsbusch. **[The Firs of Juckelsbusch.]** *Bull. Soc. for. Belg.* 66 (4), 1959 (213–47 + 2 maps, 5 photos). [F.]

A detailed account, with stem analyses etc., of a stand of very large *Abies alba*, believed to have been introduced into Luxembourg in the 18th century, with a discussion on the acclimatization of this species.

4394. PINTARIĆ, K. Studie zum Lärchenanbau in Bosnien. **[The cultivation of Larch in Bosnia.]** *Repr.* from *Rad. poljoprivred.-šum. Fak., Sarajevo* No. 2, 1958. pp. 78. 132 refs. [G.g.serb.]

On the basis of a detailed study of the climatic and ecological requirements of Larch in W. Europe, makes recommendations for introducing various provenances of *Larix decidua* to appropriate planting sites in Bosnia and Herzegovina.

4395. MÜLLER, J. Poznámky ke Kubelkovým pokusům se zavedeném douglasky do porostů v polesí Koryčany. **[Notes on Kubelka's Douglas Fir trial stands in the Koryčany area.]** *Sborn. čsl. Akad. zeměd.* (*Lesn.*) 4 (6), 1958 (535–52). 97 refs. [Cz.cz.russ.g.]

Gives stand inventory data for 4 pure stands or groups, and 2 mixed stands. The oldest are ca. 60 years; the youngest was planted in 1932. Ca. half the references are European, the others N. American.

4396. MACARTHUR, J. D. **Growth of Jack, Red and Scots Pine and White Spruce plantations, 1922 to 1956 at Grand'Mère, Que.** *Pulp Paper Mag. Can.* 60 (Convention No.), 1959 (256 . . . 260). 7 refs.

Tabulates data on growth and yield for the period [cf. *F.A.* 15 No. 1258]. Up to 1956, the m.a.i. was: Red Pine 89 cu. ft./acre; Jack Pine 85; Scots Pine 71; and Spruce 24.

4397. JAMES, G. A. **Port Orford Cedar plantations in the Pacific Northwest.** *Res. Note Pacif. Nthwest. For. Range Exp. Sta.* No. 164, 1958. pp. 2. 2 refs.

Sampling of 26 plantations of *Chamaecyparis lawsoniana* in the coastal zone of Washington, Oregon, and California showed that the species was not suitable for cultivation outside its natural range, as it was highly susceptible to animal damage, slower-growing than Douglas Fir, more susceptible to cold than native species, and subject to a destructive root-rot.

4398. GUIMARÃES, R. FOOT. Plantio experimental de coníferas no interior do estado de São Paulo. **[Experimental planting of conifers in the interior of the state of São Paulo.]** *An. bras. Econ. flor., Inst. nac. Pinho* 10, 1958 (191–207). 3 refs. [Port.e.]

Presents data illustrating the initial growth (up to 3 years) of 14 conifers tried out on various sandy, siliceous and clay soils by the Forest Service of the Companhia Paulista de Estradas de Ferro, in collaboration with the São Paulo Forest Service. The most promising species to date are *Pinus radiata*, *P. insularis*, *P. montezumae*, *P. taeda*, *P. elliottii*, *P. oocarpa*, *P. patula*, *P. pinaster* and *Cunninghamia lanceolata*, all of which show remarkably good initial growth, even on poor sandy soils.

4399. KAKIHARA, M. **[On the stand composition and the standing volume table of the artificial Pencil Cedar [*Juniperus virginiana*] forest.]** *Rep. Kyushu Univ. For.* No. 9, 1958 (29–34). [Jap. jap.*e.e.*]

Studies were made in the Ino national forest. Distribution of trees by d.b.h. and tree height was normal. Increment curves for height, d.b.h. and volume, and a volume table are given. *J. virginiana* showed a more pronounced taper than *Cryptomeria japonica* and *Chamaecyparis obtusa*.

4400. HARADA, M. **On the growth of *E*[*ucalyptus*] *rostrata*.** *Rev. Kyushu Univ. For.* No. 11, 1958 (83–90). [E.e.span.]

Reports on observations in 1956–58 in young plantations at different altitudes, concluding that: (1) *E. rostrata* is resistant to summer heat, low winter temperature and wind; (2) growth is directly related to day-length, especially on poor soils; (3) good drainage gives increased growth; (4) the presence of clay improves growth; (5) on steep slopes, fertilizer application improves growth only temporarily; on gentle slopes, where the fertilizer is retained in the soil, effects are still visible after some considerable time. On a favourable site, mean height 3 years after planting was 6·34 m. and basal diameter 8·6 cm.

4401. MATHAUDA, G. S. **Eucalypts for the dry zone.** *Indian For.* 85 (4), 1959 (211–24). 31 refs.

Discusses general problems, lists species likely to be suitable for dry-zone afforestation in India, with indications of climatic requirements, and gives an appendix on propagation techniques.

4402. CHIANI, R. G. Aplicaciones de la madera de eucalipto. El eucalipto 'cara familiar' del paisaje pampeano, resulta un importante productor de maderas para diversos usos. **[Uses of Eucalypt timber. Eucalypts, a familiar sight in the Pampas territory, constitute an important source of timber for different purposes.]** *Bol. argent. for.* 17 (170/171), 1959 (10–1). [Span.]

Reviews briefly the extent of Eucalypt cultivation in the Pampas, where it is mainly used for roadside planting and windbreaks. The author deplores the fact that the species used are not those most suitable for commercial exploitation, that no proper silvicultural measures are taken, and that the wood is used almost exclusively for fuel and fence posts; he advocates a more systematic and rational system of cultivation and utilization.

4403. NAWAZ, M. **Economics of growing Willows [in N.W. Frontier Province].** *Pakistan J. For.* 9 (2), 1959 (132–4).

An experimental plantation of 2 acres of *Salix babylonica*, *S. tetrasperma*, and *S. acmophylla*, established in Attock Forest Division in 1942, has given a net income of Rs. 140/year. Data on establishment costs, height and diameter increment, and yield per tree are given for each species.

4404. KOELMEYER, K. O. **Teak plantations in Ceylon.** *Ceylon For.* (*n.s.*) 3 (2), 1957 (178–84).

Includes climatic and site data, methods of formation, injuries, and volume tables for existing plantations, now totalling ca. 9100 acres. [Cf. *F.A.* 20 No. 4414.]

4405. ROSS, P. **Teak in Trinidad.** *Econ. Bot.* 13 (1), 1959 (30–40). 5 refs.

A note on the method of establishing and tending Teak and on its local utilization, including that of thinnings. Age-class distribution in the 10,000 acres planted, yield-table figures up to 20 years and finance of hot-and-cold impregnation are given.

4406. ACOSTA SOLIS, M. O cedro cubano—árvore excelente para cultura florestal tropical e subtropical. **[*Cedrela mexicana*—an excellent tree for tropical and subtropical forestry.]** *An. bras. Econ. flor., Inst. nac. Pinho* 10, 1958 (150–2). [Port.]

Describes briefly methods used in raising *C. mexicana* at 'La Mina' in Guayas province, Ecuador, where the first Ecuadorean plantation of this species was established in 1930. Some data on increment and yield up to the age of 20 years are included.

232.12. Races and Provenance Trials

See also Nos. 4168, 4170, 4186, 4764, 5067.

4407. BYRNES, W. R., GERHOLD, H. D., and BRAMBLE, W. C. **Douglas Fir varietal tests for Christmas tree plantations in Pennsylvania.** *Progr. Rep. Pa. agric. Exp. Sta.* No. 198, 1958. pp. 6. 13 refs.

In the tests reported, involving 19 provenances and 24 test plantings, each containing at least 1 representative of each of the 3 main varieties, the *glauca* variety was judged best in terms of survival, growth, hardiness etc. Var. *viridis*, though slightly faster in growth, suffered most from cold and drought.

4408. HOLST, M. J. **Our co-operative White Spruce provenance experiment.** *Woodl. Sect. Index Canad. Pulp Pap. Ass.* No. 1794 (*F*-2), 1959. pp. [10].

Gives data on the seed provenances, preparation of plots, experimental lay-outs etc. for provenance studies by the Petawawa Forest Experiment Station in the Great Lakes—St. Lawrence forest region.

4409. ROBAK, H., Overvintringen av mellomeuropéisk gran i Vestlands-planteskolene. Nyere observasjoner. **[Overwintering of central European Norway Spruce in Vestland nurseries; some recent**

observations.] *Årsskr. norske Skogplantesk. 1958*, 1959 (19–47). [Nor.]

[Cf. *F.A.* 18 No. 1481.] Presents tabulated summaries from 8 nurseries for the period 1952–57. In general, all plants of German and Austrian provenance older than 1 + 0 survived as well as those of Norwegian provenance, although there is always a risk of damage to 2 + 0 plants when September frosts follow an abnormally cool summer, conditions rare in the Vestland nurseries. Most 1 + 0 plants overwintered satisfactorily but quite a number were killed by frosts in Nov. 1952, Oct. 1955 and Sept. 1957, after poor summers resulting in incomplete ripening. Seed from the Bayerischer Wald (800–1250 m.) appeared to give plants with best survival of the provenances tested. Austrian provenances were generally satisfactory. Provenances from higher altitudes in the Schwarzwald (830–1080 m.) seemed to give better results than those from the Harz (400–700 m.), but factors other than provenance may have been involved here.

4410. EDWARDS, M. V. **First report on an investigation begun in 1935 into three races of European Larch.** *Rep. For. Res. For. Comm., Lond. 1957/58*, 1959 (164–83 + 5 photos). 18 refs.

Describes the early forest stages of a provenance experiment at Drummond Hill and Clashindarroch forests with (*a*) Alpine (Münsterthal, Switzerland), (*b*) Sudeten (Silesia), and (*c*) Scottish (Darnaway, Morayshire) origins of European Larch. Differences in height due to nursery origin persisted for 22 years at the slow-growing, and for 17 years at the faster-growing site. Height growth of (*a*) was less and the crop much less uniform than those of (*b*) and (*c*), and (*a*) plants flushed earlier in the spring. The stem form of (*c*) is the best. Both experiments were subject to dieback in the canopy-forming stage; (*a*) suffered worst on the poor site and was the only provenance to suffer on the better one; (*b*) and (*c*) were more uniformly resistant to canker caused by *Dasyscypha willkommii* than (*a*), though individual (*a*) trees were resistant. It is concluded that, though (*a*) may be adequately resistant on the most favourable frost-free Larch sites, the risk of frost is generally too great to allow for the use of this or other Alpine origins.

4411. WOOD, R. F., and LINES, R. **Provenance studies.** *Rep. For. Res. For. Comm., Lond. 1957/58*, 1959 (51–7). 3 refs.

Certain of the older Lodgepole Pine experiments are now beginning to give information on yields. Some observations are made on the Albertan provenance, which in the more difficult environments now seems likely to prove disappointing. The growth of Polish Larch in Britain is briefly reviewed on the basis of somewhat scanty experience. Preliminary performance of the younger experiments, and the results from a few older stands, suggest that Polish Larch is very suitable for use in Britain, especially on the more exacting sites, though stem form has been rather disappointing. Sitka Spruce provenance experiments in the north have shown highly significant differences in the % of trees with dead leaders following frost damage. A close relationship exists between the damage and the occurrence of trees with Lammas shoots, these being much more frequent in the Washington provenances than in those from the Queen Charlotte Islands. The possibility of using Washington or other southern seed sources for non-frosty localities is discussed.

4412. THÜMMLER, K. Beobachtungen an 6-jährigen Nachkommenschaften freiabgeblühter Einzelstämme von *Pinus contorta* Douglas (*Pinus murrayana* Balfour) verschiedener Herkünfte. **[Observations on 6-year progeny of single open-pollinated trees of *P. contorta* of various provenances.]** *Arch. Forstw.* 7 (10/11), 1958 (862–73). 9 refs. [G.g.russ.e.]

Preliminary observations on the mortality, height increment, branching [false whorls etc.], Lammas shoots and cone production in the 5th and 6th growing seasons, of the progeny of Salmon Arm (9 trees), Sundre (23), Cypress Hills (11) and Peace River (6) provenances, the seed of which was collected from the Tharandt Forest trial [see *F.A.* 16 No. 2873] at 370 m. alt. and planted as 2-year seedlings (144 each) in a very exposed site in the Frauenstein forest range at 640 m.

4413. PETRINI, S. De två äldsta svenska tallproveniensförsöken. **[The two oldest Pine provenance trials in Sweden.]** *Medd. Skogsforskn-Inst., Stockh.* 48 (11), 1959. pp. 49. [Sw.sw.g.g.]

Presents data from a 1957 evaluation of two trials in S.W. Sweden established in 1904 and 1906 with mostly Swedish provenances. Though the Northern provenances had generally straighter stems and finer branches, their volume production was very low (3·9–5·8 cu.m./ha./annum). Highest volume production (11 cu.m.) was reached by provenances from Västergötland and Småland, and the trials are thought to confirm the view that seed from distant sources should not be used. *From author's summary.*

4414. WEERARATNA, W. G. **An analysis of results of some Teak seed origin trials in Ceylon.** *Ceylon For.* (*n.s.*) 3 (1), 1957 (69–72).

Statistical analysis of 13- and 14-year-old plots showed no significant difference between seed of Anamalai, Nilambur, Travancore and local Ceylonese origin, but seed from Burma was significantly inferior. [Cf. *F.A.* 20 No. 4404.]

232.13. Trials of Hybrids and Other Products of Tree Breeding

See also section 165.

4415. WRIGHT, J. W., and FREELAND, F. D., JR. **Plot size in forest genetic research.** *Pap. Mich. Acad. Sci.* 44, 1958 (1959), (177–90). 4 refs. L.S.

Measurements were made (*a*) of the height of 350 trees in a 6-year Red Pine plantation, (*b*) of the diam. of ca. 1000 trees in a 17-year Tulip Tree plantation in Michigan, and these were treated as if the planting had consisted of plots varying between 1 and 35 trees on (*a*) and 1 and 64 trees on (*b*). Statistical analyses were made of the relationship between plot size and the replications needed (in progeny trials) to show in (*a*) a difference of 0·34 ft. in height and in (*b*) a difference of 0·29 in. in diam.

between progeny means. For both species there was a rapid decrease in statistical efficiency with increasing plot size, e.g. in (*a*), 35-tree plots were only 12%, and in (*b*) 64-tree plots only 18·5%, as efficient as one-tree plots. The decrease in efficiency for (*b*), where site conditions were very uniform, was particularly striking.

4416. ARNBORG, T., and HADDERS, G. **Studies of some forestry qualities in clones of *Pinus silvestris*.** *Meddelanden från Göteborgs Botaniska Trädgård* (*Acta Horti Gotoburgensis*), *Göteborg* 21, 1957 (125–57). 30 refs. [E.e.] E.M.B.

Reports on trials of clones of plus trees selected usually from pure stands of good quality, for superior growth [rate] and quality (viz. straight trunk, narrow to intermediate crown and slender branches, but with varying branch angles). Clones examined are at Kratte Masugn and Moviken (Gävleborg), Rammlösa (Malmöhus), and Nedansjö (Västernorrland). Considerable variation in height growth was found between clones, and those growing fast in the first few years after grafting generally continued to do so. For most clones there was a close direct relation between height and diameter growth. Variations in branch angle within clones were small but differences between clones were significant; branch angles of clones and mother trees tended to be similar. Differences between, but not within, clones were found for branch length, abundance of flowering, shape and size of terminal bud, and type of needle.

4417. SEBALD, O. Ergebnisse von Pappelsorten-Vergleichsversuchen. I. Erste Auswertung der 1948 bis 1953 in Nordwürttemberg angelegten Beobachtungsflächen. **[Trials of Poplar varieties. I. First results of observation plots established in N. Württemberg from 1948 to 1953.]** *Mitt. Ver. forstl. Standortskunde ForstpflZücht*. No. 8, 1959 (3–34 + 8 photos). 33 refs. [G.g.]

Reports on trials in the mild Neckar region (54 plots) and the colder Schwabische Alb (6). The commercial and experimental varieties included Black Popular × Balsam Poplar hybrids, and also seedlings, including artificial crosses, of the section *Leuce*, all 7 to 12 years old. No significant differences in site requirements emerged except that certain Balsam × Black Poplar hybrids appeared to be more tolerant of shade and cold climates, though possibly less drought-resistant, the 'Oxford' Poplar proving the most promising variety to date. Root development appeared to be more related to soil conditions than to variety. Unexpectedly good growth was obtained on heavy marly clays, while fertile, fresh, loess loams, with slightly acid topsoils, gave disappointing results.

232.2. Preparatory Work. Auxiliary Measures

See also Nos. 4107, 4367–8, 4520, 5401.

4418. MURRAY, N. **Report on mechanical preparation of derelict woodland for planting.** *Irish For.* 16 (1), 1959 (20–1).

Gives details, with costs, of the work involved in clearing heavy slash with a bulldozer and burning the resulting 10–12 heaps/acre. Average costs worked out at ca. £16/acre compared with an estimated £20–25 for hand clearance.

4419. WALKER, L. C., and BRENDER, E. V. **Planting following prescribed fire.** *J. For.* 57 (2), 1959 (123–4). 1 ref.

A week after a prescribed winter burn to reduce understorey hardwood competition which prevented adequate natural regeneration, 1-year Loblolly Pines were planted. Survival and height data after 4 years indicate that the method is effective in converting brush to good Pine stocking.

232.3. Seed, Nursery Practice, Direct Sowing

232.31. Seed

See also No. 4354.

4420. MESSER, H. Das Fruchten der Waldbäume als Grundlage der Forstsamengewinnung. I. Koniferen. **[The fruiting of forest trees as a basis for the harvesting of forest seed. I. Conifers.]** *Mitt. hess. Landesforstverw.* No. 1, 1958. pp. 108. 67 refs. [G.] Price *DM*.10.50 (17*s*. 6*d*.).

A paper based on European literature and on the author's own published and (particularly as regards Scot Pine) unpublished investigations. Part I covers the development, growth and ripening of cones and seed, the effect of ripeness on germination, and harvesting times for different (German) growth regions, altitudes, aspects etc., for Scots Pine, Norway Spruce, and European Larch, and in less detail for Weymouth Pine, Silver Fir and Douglas Fir. Part II covers, for the first 4 species only, cone crops and seed yields (including seed quality) for single trees and stands, age and crown classes, parts of crown, provenances, altitude etc., and the effect of fruiting on increment etc. [Cf. *F.A.* 17 No. 2696; 18 No. 1491; 20 No. 1706.]

4421. MESSER, H. Der Wassergehalt des Forstsaatgutes als Grundlage der Ernte-, Veredelungs- und Aufbewahrungsmassnahmen. **[The moisture content of forest seed as a basic factor in harvesting, kiln drying and storage.]** *Forst- u. Holzw.* 14 (10), 1959 (226–9). 11 refs. [G.]

A short review of recent German literature [cf. *F.A.* 20 Nos. 1705–6, 1717, 3609].

4422. Semi forestali. **[Forest seeds.]** *Boll. Corpo for. Stato* 1958 (12), (900–2). [It.]

Regulations as to: (1) choice of provenance of *Pinus nigra* for different site types on (*a*) calcareous, (*b*) siliceous or clay soils; (2) storage of *Abies alba*, *Pinus pinea* and *P. pinaster* seed; (3) age of trees of *A. alba* from which seed should be collected (40–100 years).

4423. **The Bulolo stand in perpetuity.** *Aust. Timb. J.* 25 (2), 1959 (52 . . . 81).

[Cf. *F.A.* 20 No. 2410.] A fully illustrated article devoted mainly to the plantation establishment of *Araucaria cunninghamii* and *A. klinkii*, that for the former based on 30 years' Queensland experience; the silviculture of the latter is still experimental. Preliminary details for the species, here given, cover embryo development, cone ripening, seed collection, preparation, and storage, detailed nursery techniques, including tubing, modified from Queensland practice for this slower growing, more shade-demanding and more strongly tap-rooted seedling. A tendency to base-induced chlorosis is countered with 15 lb. of ground sulphur applied to beds 2 months before sowing. The programme for preparing the planting site is given. The fibres of *A. klinkii* are 6–11 mm. long and thinnings might well be utilized as pulpwood.

232.311. Seed Production (Seed Years, Seed Crops; Seed Orchards and Methods of Inducing Seed Production)

See also No. 4540.

4424. INOU(Y)E, Y. **[Study on the special type of the middle forest [coppice with standards] system of Akamatsu. (IV). Annual variation in the seed crops of Akamatsu.]** *Bull. Kyushu Univ. For.* No. 30, 1958 (103–25). [Jap.e.]

[In the special type in question the upper storey is even-aged *Pinus densiflora* forest and the lower storey coppice.] Seed was studied for 6 years from sample trees on 40 plots of coppice-with-standards, of various site conditions and densities, and 10 plots of regular forest, ages varying from 35 to 70 years. Fluctuations in cone crops proved to depend on individual trees and seed-years, and on age, density, site conditions etc. in a seed-year. Cone crops of individual trees varied widely from year to year, and mean values from 32 cones in a poor year to 182 in a good year. Variation was less on lower mountain slopes where conditions are favourable than on inferior, higher sites, which yielded more cones except in poor cone years. Average cone crop increased slightly with age and was higher for trees in sparse coppice-with-standards than in dense pure forest. A high correlation was found between number of cones and age, d.b.h., stem volume and crown volume. No correlation was found between number of seeds per cone and age, but mean number of seeds per cone was slightly higher in individuals in sparse than in dense forest and on good than on poor sites, and cones in a good year had a slightly larger number of seeds than in a poor one. All samples of seed had a high germination % (73–97%, mean 84%), and correlations similar to those for number of seeds per cone were found between germination % and stand density and site class. Seed crops per tree—(mean number of seeds per cone) × (number of cones)—ranged from 19 to 9632, mean 3872. Seed crops of individuals varied directly with the number of cones. The calculated annual yield of seed per ha. ranged from 20,000 to 6,130,000 with means of 3,020,000 in good years, 1,840,000 in normal years and 490,000 in poor years. Yield per ha. was greater in dense than in sparse forest and decreased with stand age. *From author's summary.*

4425. STERN, K. Der Inzuchtgrad in Nachkommenschaften von Samenplantagen. **[The degree of inbreeding in progenies of seed orchards.]** *Silvae Genet.* 8 (2), 1959 (37–42). 16 refs. [G.g.e.f.]

The rate of inbreeding in progenies of seed orchards of varying number of clones was calculated. It is suggested that for nearly ideal panmixis 20–30 clones, for greatly restricted panmixis 30–40 clones, and with continued selection of *N* clones through several generations 40–50 clones will be sufficient for each seed orchard to avoid inbreeding effects. *From author's summary.*

4426. MITCHELL, A. F. **Establishment of a seed orchard for the production of hybrid Larch seed.** *Rep. For. Res. For. Comm., Lond. 1957/58*, 1959 (137–47). 6 refs.

The composition, lay-out and establishment of the Newton Seed Orchard for the production of hybrid Larch seed are described. The following conclusions are drawn: (1) Establishment may take several years when grafts are moved to a site. When possible, grafting should be done directly on to rootstocks planted on the site. Strongly grown scion material is necessary. (2) The orchard should be planted at ≮ twice the final density, so that more flowers are available for testing in the first year of flowering and early yields of seed are increased. (3) Grass sward should be established early for ease of working, control of nutrients, and to prevent deterioration of the soil. (4) Staking should only be resorted to when very necessary, and then for a maximum of 2 years. (5) At Newton the cone production may depend greatly on the temperature in mid-July. (6) Cone production will thus probably be erratic, and means of achieving a more even flowering are worth trying. Geotropic treatments involving the tying down of branches seem promising [cf. *F.A.* 20 Nos. 127–8].

232.312. Seed Collection, Extraction and Grading (including Seed Weight)

4427. EDLUND, E. Höstplockning av tallkott. **[Autumn picking of Pine cones.]** *Norrlands SkogsvFörb. Tidskr.* 1959 (1), (11–21). [Sw.sw.]

Tests of seed from cones collected at 400 m. alt. near Lycksele in Sept. 1957 and stored until Aug. 1958 gave a mean germination %, after 20 days in a germinator, of 66·6%, compared with 15·7% for controls from cones collected in April 1958.

4428. CARMICHAEL, A. J. **Determination of the maximum air temperature tolerated by Red Pine, Jack Pine, White Spruce and Black Spruce seeds at low relative humidities.** *For. Chron.* 34 (4), 1958 (387–92). 5 refs.

Tests showed that high temperatures are much more damaging when combined with high humidities and applied over a long period. For *Pinus resinosa*, *P. banksiana* and *Picea mariana*, 180° F. was scarcely damaging while the relative humidity (r.h.) of the air was kept low. *Picea glauca* was an exception, but it remained almost unaffected at 150° with low r.h. The results indicate that a short period of exposure at 135° and 20% r.h. would be safe for all species. For each species, when the temperature became critical, with increasing r.h., damage became evident within progressively shorter periods.

4429. YLI-VAKKURI, P. Siemensiipien hankaajista ja niiden vaikutuksesta siemenen itävyyteen. **[Machines for abrading seed wings and their influence on the germinative capacity of the seed.]**

Repr. from *Acta for. fenn.* No. 68, 1959. pp. 13. 17 refs. [Fi.e.]

Describes tests with two Finnish de-winging machines on seed of Pine and Spruce, indicating that abrasion may cause slight or even serious injuries. Slight injuries to ca. 5% of the seed may have to be accepted in machine de-winging. [Cf. *F.A.* 19 No. 1638.] *From author's summary.*

4430. GROSE, R. J., and ZIMMER, W. J. **The collection and testing of seed from some Victorian Eucalypts with results of viability tests.** *Bull. For. Comm. Vict.* No. 10, 1958. pp. 14. 4 refs.

Methods of collecting and testing Eucalypt seeds are described, and the available information on their longevity is reviewed with some fresh evidence on the subject. Data on number of viable seeds per capsule, per capsule cell, and per oz. of seed plus chaff, of many Victorian Eucalypts are given. *From authors' summary.*

4431. GROSE, R. J., and ZIMMER, W. J. **Influence of seed size on germination and early growth of seedlings of *Eucalyptus maculata* Hook. f. and *Eucalyptus sieberiana* F. v. M.** *Bull. For. Comm. Vict.* No. 9, 1958. pp. 10. 2 refs.

Seeds of 4 distinct size-ranges from a seed-lot of each species were germinated at constant temperature on moist filter paper and in soil. In all cases the large seed germinated faster than the small, and in soil cultures also gave a larger % germination. After 7 weeks, % survival of seedlings from the smallest seeds of both species was lower than that for seedlings grown from the 3 larger size-ranges of seed. Size of seed also determined the absolute growth of seedlings for at least 16 weeks after emergence, probably owing to the influence of cotyledon area. It is probable that seed size has a similar influence on germination and early growth of seedlings of all Eucalypts.

232.314. Seed Purchase, Trade and Transport (including Seed Certification and Legislation for this Purpose)

4432. ROSSMÄSSLER, W. Kontrollzeichensaat- und Pflanzgut. **[Seed and planting stock guaranteed by quality mark.]** *Allg. Forstzeitschr.* 14 (13), 1959 (270–2). [G.]

As the present German law [cf. *F.A.* 19 No. 2918] provides for certification only as regards major growth regions, the 'Deutsche Kontrollvereinigung für forstliches Saat- und Pflanzgut', an officially recognized body of commercial and forestry interests, provides a label certifying individual named provenances. A first list of such provenances is attached.

232.315. Seed Storage and Treatment

See also Nos. 4445, 4447, 4772.

4433. HOLMES, G. D., and BUSZEWICZ, G. **Forest tree seed investigations.** *Rep. For. Res. For. Comm., Lond. 1957/58*, 1959 (17–20).

Long-term seed-storage trials for Scots and Corsican Pine, Sitka and Norway Spruce, European and Japanese Larch, and Birch (*Betula verrucosa*) were concluded at the end of 7 years' storage. All species had deteriorated seriously after 2 years' storage in sacks in a cool room. With the exception of the Larches, very little drop in germinative capacity occurred after 7 years' storage of dried seed in sealed containers at 2° C., and this is clearly a satisfactory method of long-term storage for most conifer seed. In the case of the Larches, the seed lots started with a low germination figure and moisture content above normal. In sack storage the seed went bad in a year, but germinative capacity was reasonably well maintained for 2–3 years in sealed tins at 2° C.

4434. VINCENT, G. Die Lagerung von Saatgut in geschlossenen Gefässen. **[Storing seed in closed containers.]** *Cbl. ges. Forstw.* 75 (3/5), 1958 (257–67). 28 refs. [G.]

Reports tests with seed of Norway Spruce (*a*), European Larch (*b*), Scots Pine (*c*), *Betula verrucosa* (*d*), *Alnus glutinosa* (*e*) and *Ulmus carpinifolia* (*f*), stored in sealed glass bottles at cool temperatures. The conifers were bottled immediately after extraction, the others fresh or after 1 to 5 days drying at 30° C. Over 5 years, (*a*), (*b*) and (*c*) lost very little in germinative capacity (g.c.) but considerably in germinative energy (g.e.), results in all cases being far superior to storage in the cones or in bags [cf. *F.A.* 12 No. 270]; (*d*) bottled fresh retained only 24% of original g.c. after 4 years, but 50–65% if bottled after drying; (*e*) retained 90% of its g.c. but g.e. decreased considerably; (*f*) kept its g.c. equally well for 3 years, but after 4 years g.c. fell to nil. None of the bag-stored hardwood seeds were viable after 4 years. All seeds slightly increased their m.c. during closed storage, suggesting that drying was not responsible for the changes in g.e. Optimum m.c.'s are given as 6–8% for (*a*), (*c*) and (*d*), 7–10 for (*b*), 5–7 for (*e*) and 9–11 for (*f*).

4435. NELSON, A. E. **Storage of Black Spruce [*Picea mariana*] seed for 19 years.** *J. For.* 57 (6), 1959 (438).

Two samples of seed collected in 1936 and stored in airtight cans in a building where temperatures varied from < 32 to ca. 75° F., showed after a cold soak 74 and 80% germination in 1955.

4436. LØKEN, A. Stratifisering av sitkagranfrø. **[Stratification of Sitka Spruce seed.]** *Årsskr. norske Skogplantesk. 1958*, 1959 (47–50). [Nor.]

[Cf. *F.A.* 20 No. 401.] Experiments were made in 1958 with seed from American sources collected in 1957 and germinating very much more slowly than Norwegian seed. Seed was stratified for 15, 30 or 60 days either on filter paper in a Petri dish or in a cone of filter paper resting in the neck of a wide-mouth bottle, and the number of seeds germinating in a Jakobsen germinator after 7, 14 and 21 days was determined. Results are tabulated. Speed of germination of seeds stratified for 15 and 30 days was higher, and that of those stratified for 60 days lower, than in untreated controls. The germination % of some lots stratified 15 and 30 days was higher and for others lower than in the controls; stratification for 60 days considerably reduced germination compared with controls. A study of the non-germinating seed showed that few were either still living or empty; the % of dead seed increased considerably with increasing length of stratification, and microscopic examination showed that, in one lot at least, the seed had been attacked by fungus.

4437. RODGER, G. J. **[Treatment of *Pinus radiata* seed.]** *Rep. For. Timb. Bur. Aust. 1957*, 1958 (20).

Cold moist stratification at 38° F. for varying periods of 3–28 days, or soaking at room temperature for 3 days, significantly increased the rate of germination. Soaking for 7–14 days at room temperature gave still more rapid germination, but some testas split, and the seed was liable to desiccation.

4438. RICHTAR, B. Výsledky některých způsobů předosevní přípravy semen na kvalitu a kvantitu semenáčků. **[The results of various methods of seed pre-treatment on the quality and quantity of seedlings.]** *Sborn. čsl. Akad. zeměd.* (*Lesn.*) 5 (1), 1959 (97–106). 4 refs. [Cz.cz.russ.g.]

Seeds of *Pinus sylvestris* and *Larix decidua* were pre-germinated (*a*) under constant illumination and (*b*) under normal light conditions, and then sown. Seeds were also sown after soaking in water for (*c*) 72, (*d*) 48, and (*e*) 24 hours; plus untreated controls (*f*). Data on germination, survival, and seedling size are graphed, and show that with Larch (*a*) and (*b*) gave fewer but bigger seedlings than (*f*), while (*c*), (*d*) and (*e*) were intermediate. With Pine, (*a*) and (*b*) gave the best results, both quantitatively and qualitatively.

4439. CORNS, W. G. **Some factors affecting the germination of the seed of Vine Maple (*Acer circinatum*).** *Abstr.* in *Res. Rep. West. Sect. nat. Weed Comm. Can.* 1957 (131–2). O.R.E.

Studies under laboratory and outdoor conditions showed that seed of *A. circinatum* required a long after-ripening period with low temperature and adequate moisture before growth occurred. Removal of the samara-wall hastened germination. Germination % of stratified, freed seeds was the same whether or not the seed coat was ruptured. Limited tests with seeds treated with 20 p.p.m. gibberellin solution indicated that this chemical had no effect on germination of intact samaras, but improved the germination of some samples of excised seeds that had been stratified.

232.318. Seed Testing. Germination Tests. Seed Quality

Seed also No. 4430.

4440. PHILIPPIS, A. DE. Il laboratorio per i semi forestali nel suo primo decennio. **[The first 10 years of the Forest Seed Laboratory [of the Institute of Forestry, Florence].]** *Repr.* from *Note forestali, Firenze*, 1958. pp. 25.

Some account of methods, equipment etc., and research projects finished or in progress.

4441. LØKEN, A. Spireforsøk i kjølerom. **[Germination experiments in a refrigerator chamber.]** *Medd. Vestland. forstl. Forsøkssta.* 11 (1), No. 33, 1959 (1–19). 6 refs. [Nor.e.*e*.]

The seed tested was of Scots Pine, Norway and Sitka Spruce, and Japanese Larch, the refrigerator chamber being kept at 2–4° C. In the first experiment two lots of Sitka seed were germinated in sand in a germinating bell; one lot exposed to constant light showed germination of 13·5 and 17·8% respectively after 4 and 5 months, whereas the second lot kept in complete darkness showed no sign of germination, possibly because of heavy mould which cemented the seed and sand into an air-tight cake. In another series of experiments seeds of 3 provenances of Pine, 4 each of Norway and Sitka Spruce, and one of Japanese Larch were germinated in a simplified Jakobsen germinator, lit by two 40-watt lamps suspended 70 cm. above the germination layer. Germination started in Pine after 70 days, followed by Norway Spruce (70–80 days), Larch (100–120 days) and Sitka (100–140 days). Most of the Pine seed (81–92%) had germinated after 220 days, while with the other species this point was not reached in 380 days. It is possible that with germination at these low temperatures there is some relationship between date of seed dispersal and speed and extent of germination.

4442. SANTA, G. DELLA. Sulle condizione di germinazione del cipresso comune. **[The conditions for germination of *Cupressus sempervirens*.]** *Ital. for. mont.* 14 (2), 1959 (49–56). 6 refs. [It.f.]

Experiments on seeds of *C. sempervirens* showed that germinative energy increased from 13° C. to 20° and then diminished; optimum temperature is between 19° and 21·5°. The mean period of germination diminished steadily and considerably from 13 to 20°, and increased between 20 and 24·5°; at 27° it lost all significance, as the S.E. became excessive. Germination trials may safely be reduced from 28 to 21 days. The behaviour of Cypress seed with regard to temperature is similar to that of Pines of Mediterranean provenance.

4443. KANTOR, J. Vliv naklíčení, různého poškození klíčku a váhy semen na vývoj semenáčků kaštanu jedlého. **[The effect of pre-germination, different degrees of damage to the radicles, and seed weight, on the development of *Castanea sativa* seedlings.]** *Sborn. čsl. Akad. zeměd.* (*Lesn.*) 5 (3), 1959 (347–52). 7 refs. [Cz.russ.g.]

[Cf. *F.A.* 19 No. 337.] Germinated seeds (*A*) (35–77 per variable) were divided into (1) floaters, and (2) sinkers, the latter being subdivided into those with (*a*) an undamaged radicle, (*b*) half and (*c*) the whole radicle broken off. Non-germinated seeds (*B*) were also dividedinto (1) floaters, and (2) sinkers, and the latter into (*a*) small, (*b*) medium, and (*c*) large. All seeds were set out at 15 × 15 cm. spacing. Taking (*A*1) as 100, seedling heights at 2 years were (*A*2*a*) 143, (*A*2*b*) 129, (*A*2*c*) 136, (*B*1) 107, (*B*2*a*) 129, (*B*2*b*) 150 and (*B*2*c*) 164. Categories (*A*1 *b* and *c*) grew, provided the radicle was about the same length as the seed at the time it was broken. All floaters, both of (*A*) and (*B*), had a lower viability than the sinkers. There was no great difference either in number or height of germinated seedlings, between (*B*2*a*, *b* and *c*).

232.32. Plant Rearing. Nursery Practice

See also Nos. 4401, 4423.

4444. Skovplanteskoler. **[Forest nurseries.]** *Dansk Skovforen. Tidsskr.* 44 (3), 1959 (157–238). Many refs. [Dan.]

Consists of the following papers: The lay-out of nurseries (*J. Hvass*); Use of fertilizers (*I. Nyholm*); Seed and nursery plants (*N. P. Tulstrup*); Equipment in large nurseries (*H. Paludan*); Pests (*B. B. Petersen*); Diseases (*J. Koch*); and Weed control (*H. I. Petersen*).

4445. FAULKNER, R., and ALDHOUS, J. R. **Nursery investigations.** *Rep. For. Res. For. Comm., Lond. 1957/58*, 1959 (20–37).

Stratification of Fir seed: Special studies on techniques for raising Silver Firs (*Abies grandis* and *A. nobilis*) were continued. Best results were obtained by chilling the seed for 24 hours at 2° C. before sowing, but stratification in moist sand for 4 weeks before sowing at the beginning of April also gave good results. Early sowing of dry, unstratified seed in Jan., Feb., or early March also gave satisfactory results.

Date of sowing: Autumn sowing of Oak gave as good results as spring sowing, but autumn-sown Beech did not always do so well. The results were not as clearly in favour of autumn sowing as was the previous year's experiment [cf. *F.A.* 20 No. 414], but the two experiments warrant the conclusion that if storage of Oak or Beech seed during the winter is likely to prove difficult, there is a reasonable chance of good results from autumn sowing. Corsican Pine was shown to benefit from later sowing (early to mid April) than Sitka Spruce (late March) or *Tsuga heterophylla* (early March).

Frequency of weeding: Hand weeding at intervals of 6 weeks was found to involve nearly twice as much labour as weeding at intervals of 4 or 2 weeks (total weeding times in min./sq. yd. 25·7, 14·6, and 15·4 respectively). The lack of difference between the 2- and 4-weekly weeding was probably due to dry weather at the start of the season: in a wet season there would probably be a difference in favour of the 2-weekly.

Plant handling and storage: Experiments on storage of planting stock in polythene bags [cf. *F.A.* 20 No. 414] continued. Plants tolerated storage for periods of 2 weeks up to 6 months according to species and the condition of plants at the time of lifting. Spruces were outstanding in their ability to survive long periods of storage, *Abies procera* seedlings were the least tolerant. General conclusions drawn from the experiments were: (i) Transplants are better able to tolerate storage in polythene bags than seedlings. (ii) Plants store better when lifted dormant than when bud or root development has begun. (iii) Plants lifted with wet foliage do not store as well as those lifted with dry. (iv) Spread of fungi is not a great hazard—*Botrytis* in particular does not spread in the bags. In another experiment to determine the power of survival of seedlings on transplanting after exposure of their roots, it was found that under moderately drying conditions (not sunny, but with a fairly strong wind and relative humidity 77% falling to 54% at noon) seedlings began to lose their power of survival after only 2 hours' exposure of their roots, and 6 hours' exposure resulted in nearly 100% casualties. On a still day with r.h. not falling below 87% all day, 6 hours' exposure did no harm. Species tested were Douglas Fir, Corsican Pine, and Lawson Cypress.

4446. PUDDEN, H. H. C. **Establishment of *Pinus patula*. Some effects of nursery treatment on subsequent growth.** *Tech. Note For. Dep. Kenya* No. 59, 1958. pp. 2.

Reports growth at 2½ years, for different plant-tray positions (sunk, on ground (normal), or raised one inch) and spacing in lines (6 × 6, 4 × 4, or 2 × 2 in.), and 6 fertilizer treatments at planting out. Significantly greater height at 2½ years was shown by plants (*a*) from sunk trays, (*b*) at 6 × 6 in. spacing and (*c*) given 25 g. of basic slag.

4447. **[Nursery treatment for *Terminalia ivorensis*.]** *Rep. For. Dep. Ghana 1955/56*, 1958 (45).

As a result of research work, a directive has been issued on nursery treatment of *T. ivorensis*, which is recommended as a major species for taungya plantations. After soaking for a week, seed should be de-winged, sown thickly broadcast on a seedbed, and lightly covered with soil. Seedlings should be transplanted in dull weather after the first pair of true leaves appear (usually in 4–6 weeks). Daily watering is necessary at first.

232.321. Nursery Sites, including Factors affecting Selection of Sites for Nurseries

4448. PECK, C. K., STRACH, J., and STEKIEL, R. J. **Observations on growing Douglas-Fir planting stock in small intraforest nurseries.** *J. For.* 57 (6), 1959 (413–5). 1 ref.

Following pre-war experience in Poland, the possibilities were investigated in Washington of using small, temporary nurseries inside the forest, near areas to be planted up within two years. This is in contrast to the general U.S. practice of having large, permanent nurseries. It is very important to site the nursery in correct proximity to the western sheltering overwood. In trials, excellent Douglas Fir planting stock was obtained from seed sown in these 'intraforest' nurseries, when the seed was protected by repellents, and certain biotic controls (against weeds, etc.) were used. No irrigation or artificial shading was required, even in the warm dry summers of 1957 and 1958.

232.322. Preparation and Treatment of Soil, including Maintenance of Fertility

See also Nos. 4134, 4253, 4257, 4475, 4610, 4708, 4775, 5232, 5366.

4449. SCHAIRER, E. Düngung von Pflanzschulen und Kompostbereitung. **[Fertilization in forest nurseries, and the preparation of composts.]** *Allg. Forstzeitschr.* 14 (20), 1959 (377–81). [G.]

A leaflet for nurserymen giving prescriptions for various soils and plants, and for the making of peat and soil composts, with notes on dosages and/or composition of various German proprietary mineral and organic fertilizers.

4450. JUNG, J. Agrikulturchemie und Forstpflanzen-Ernährung. **[Agricultural chemistry and the nutrition of forest plants.]** *Allg. Forstzeitschr.* 14 (20), 1959 (365–9 + 4 plates). 12 refs. [G.g.]

Discusses the use of pot and water cultures and foliar analysis, citing examples of work with forest plants at the agricultural research station of Limburgerhof, Pfalz. In pot tests with N, P and K in various forms on 2-year Poplar cuttings on a soil with pH = 4, production of dry woody matter varied greatly with N source. It was greatest with $CaNO_3$, while with $(NH_4)_2SO_4$ all plants died from excessive acidity. When pH was raised to 6·5, total production was much greater and differences were less. In a parallel series, foliar N content was considerably, and foliar P and K somewhat, higher in the pH4 than in the pH6 plots, though production of woody matter was nearly twice as high on the latter. In a 'minus' experiment, the P-less plot had an exceptionally high N content, and the N-less plot a less, but still considerable, P content, indicating that the ratios of nutrients are more important than their absolute values. Deficiency symptoms for Japanese Larch (N), Alder (P,K,Fe), Poplar (Mg,Fe) and *Liriodendron tulipifera* (Mn) in pot or water cultures are illustrated in colour. The amendment of raw humus with urea and other N sources [cf. *F.A.* 20 No. 3159] is also discussed.

4451. FRANZMEIER, D. P., and ARNEMAN, H. F. **The effect of fertilizers on the available nitrogen content of a nursery soil and on the nitrogen concentration in Red Pine seedlings.** *Minn. For. Notes* No. 77, 1959. pp. 2. 1 ref.

N, at rates from 50 to 150 lb./acre, was supplied in May to an excessively drained, coarse sand, as NH_4NO_3 (*a*), ammonified peat (*b*), and urea-formaldehyde (*c*). Two months after treatment, available N content of the soil was the same in all plots, including controls, irrespective of the rate of application. This rapid loss of N is probably due to leaching and/or loss in gaseous form to the air. It was found that (*a*) and (*b*) supplied available N to the soil at about the same rate, (*c*) more gradually. N contents of 2 + 0 and 3 + 0 *Pinus resinosa* seedlings were somewhat greater at high N applications, the differences (and the N contents) becoming less towards autumn. There was little difference in the N-supplying powers of (*a*), (*b*) and (*c*).

4452. LEASE, R. E., and DUNCAN, D. P. **Field survival of Red Pine seedlings affected by nursery fertilization.** *Minn. For. Notes* No. 75, 1959. pp.2. 2 refs.

Pinus resinosa 3 + 0 seedlings were taken from (*a*) an old (i.e. repeatedly used) nursery bed and (*b*) a new bed, both of which had received various fertilizer applications [cf. preceding abstract]. Survival rates from (*a*) were considerably higher than from (*b*), in which the highest N applications resulted in lowest survival. Ranker weed growth is thought to be a possible cause of these poorer results in (*b*).

4453. THEMLITZ, R. Magnesiumkalke—eine Magnesiumquelle für Forstpflanzen. **[Magnesian limestone as a source of Mg for forest plants.]** *Allg. Forstzeitschr.* 14 (20), 1959 (371–2). 4 refs. [G.g.]

Briefly describes pot tests with Pine seedlings using various forms and quantities of Mg-containing fertilizers. Foliar analysis indicated that burnt magnesian limestone (ca. 32% MgO and 5% CaO) was a suitable source for both Mg and Ca. [For various reasons no growth evaluation was made.]

4454. MADER, D. L. **Effect of humus amendments on growth and nutrient uptake of Monterey Pine seedlings in biocide-treated soils.** *Proc. Soil Sci. Soc. Amer.* 23 (3), 1959 (252–3). 12 refs.

In a greenhouse trial, *Pinus radiata* was grown from seed in (*a*) soil, (*b*) soil + fine mull, and (*c*) soil + matted mor humus, to which heavy doses of various biocides were applied. Some of the results are tabulated. All the biocides, especially Hg_2Cl_2, Thiosan and chlordane reduced growth, while Hg_2Cl_2, allyl alcohol and Thiosan also reduced seedling survival. In general, results indicated that addition of certain types of humus increased survival, improved growth, and counteracted changes in the chemical composition of seedlings grown in soil treated with heavy doses of biocides. Fine mull humus was generally the most beneficial. [Cf. *F.A.* 17 No. 502.]

4455. KUTÍLEK, M. Vliv textury půdy na agregaci při umělém strukturotvorném procesu. **[The influence of soil texture on aggregation when using soil conditioners.]** *Sborn. čsl. Akad. zeměd.* (*Lesn.*) 5 (4), 1959 (385–92). 6 refs. [Cz.cz.russ.e.]

Using K polymethacrylate as the soil conditioner (0·1% by air-dry weight), it was found that, with increasing content of clay particles, the quantity of macroaggregates increased (non-linearly), the stability of microaggregates also increased, and the dispersion coefficient decreased (non-linearly).

232.323. Sowing and Covering

See also No. 4714.

4456. WATKINS, G. **Sowing seed in polythene bags** *E. Afr. agric. J.* 24 (3), 1959 (197–202). 1 ref.

Results are given for sowing the seed of 16 (mainly tree) species mixed with moistened vermiculite (1 part seed + 2 vermiculite, and 1 part water to 4–6 of this mixture) in 24 × 12 in. polythene bags. Bags were ¾ filled, closed at the top, hung up, and kept at 60–70° F. The pregerminated seed is pricked out at transplant spacing. Much time, space and labour is thus saved. The merits of the method are discussed in detail.

4457. **Growth under extra light.** *Rep. Ntheast. For. Exp. Sta. 1958*, 1959 (17–8).

During 1958, Red Maple, Loblolly Pine and Virginia Pine seedlings were given 2 hours' extra light at different intensities. The lowest to cause a detectable increase in growth was ca. 1·4 ft.-candles for Maple, and ca. 5·6 for the Pines. Growth increased with light intensity to ca. 22·5 ft.-candles, but little beyond that.

232.324. Transplanting and Lining Out, including Grading of Seedlings

4458. BLOMQVIST, S. En manuell omskolningsmetod. **[A hand transplanting method.]** *Norrlands SkogsvFörb. Tidskr.* 1959 (1), (1–10). [Sw.]

An illustrated description and notes on the use of a lining-out board, carrying a rubber strip 5 cm. broad × 3 cm. thick, with spaced notches 2 cm. deep to hold the plants in position. The board has been successfully used in industrial forests since the late 1940s, and its advantages are discussed.

4459. PETRAČIĆ, A. Prilog za poznavanje visinskog prirasta smrekovih (*Picea excelsa* Link) stabalaca nastalih iz različito razvijenih sadnica iste sjetve. **[The height increment of *P. abies* stems arising from seedlings of different vigour from the same sowing.]** *Glasn. šumske Pokuse* No. 13, 1957 (5–17). [Croat.g.]

Height growth and increment up to 15 years of 72 stems per sample plot were recorded for Spruce, developed from 3-year-old nursery stock classified by height growth as (*a*) very good, (*b*) good and (*c*) poor. C.a.i. of (*b*) and (*c*) equalled that of (*a*) by the 12–13th year but as a result of more vigorous growth earlier on, (*a*) had by far the best total height.

4460. STONE, E. C., and SCHUBERT, G. H. **Seasonal periodicity in root regeneration on Ponderosa Pine transplants—a physiological condition.** *Proc. Soc. Amer. For.* 1958 (1959), (154–5).

In these experiments, continuing an earlier series [cf. *F.A.* 17 No. 3869] seedlings of two Californian provenances [see *F.A.* 9 No. 1541] were lifted every month of the year. Root elongation and initiation were absent or limited from June to August, with peak activity for one provenance in May, and the other in March. At a root-zone temperature of 20–25° C., activity was generally higher than at lower temperatures.

4461. **Successful transplanting and cold storage of seedling dependent on seasonal periodicity of root development.** *Calif. For. & For. Prod. Calif. For. Prod. Lab.* No. 10, 1959 [2].

Greenhouse studies have shown that transplanted Ponderosa Pine seedlings develop new root systems, (*a*) by elongation of lateral roots already formed when the seedling was lifted from the nursery bed, and (*b*) by initiating new lateral roots. Both elongation and initiation of roots were subject to distinct seasonal periodicity when nursery seedlings were transplanted in the greenhouse. Seedlings transplanted in July and August displayed neither activity; elongation was evident at all other seasons, while initiation was limited to the period Dec.–June. Greatest root development took place in the spring immediately before the breaking of the terminal bud. Successful cold storage of seedlings also depends on the time of lifting. Ponderosa Pine died after autumn lifting and cold storage, but seedlings lifted after 1 Nov. stored well. [Cf. *F.A.* 20 No. 4507.]

232.325. Tending (in both Seedbeds and Transplant Beds)

See also Nos. 4454, 4714.

4462. LEHTO, T. V. **New weed killer tested.** *Amer. Nurserym.* 109 (9), 1959 (14).

In the T.V.A. forest nursery at Clinton, Tenn., 24 seedbeds, each 4 × 400 ft., were treated with 3,5 - dimethyltetrahydro - 1,3,5,2H thiadiazine - 2 - thione applied from a fertilizer distributor at the rate of 12 lb. dry material/1600 sq. ft. The soil was moist, and irrigation to seal in the compound was unnecessary. The beds were sown with White Pine 5 months after treatment. At the end of the first season there were almost 3 times as many seedlings in the treated as in control beds, and they were larger and of better colour. Weeding time was less than half that on control beds. Treating cost was $350/acre, quickly recovered by increased production and reduced weeding; bulk purchase of the chemical reduced the cost of later applications.

4463. MAHLSTEDE, J. P. [Editor]. **Ornamental nurseries, forest nurseries, shelterbelts and all others.** *Res. Rep. 14th ann. Nth. Cent. Weed Control Conf.* 1957 (143–8). O.R.E.

Amino-triazole at 1, 2 and 3 lb./acre applied 45 days after emergence gave excellent weed control. Species tested were (1) *Picea mariana*, (2) *P. glauca*, (3) *Pinus resinosa*, (4) *P. sylvestris*, (5) *P. banksiana*, (6) *P. strobus*, (7) *Abies balsamea*, and (8) *Chamaecyparis thyoides*. The 1 lb. rate produced no injury on (1), (2), (3), (5), (7) and (8), but (4) and (6) showed extensive whitening of terminal growth areas. The 2 lb. rate produced no injury on (1), (2), (5) and (7), but extensive injury on (3), (4), (6) and (8). The 3 lb. rate produced < 5% injury on (2) and (7), but severe damage on all other species. In a comparison of various growth substances on seedlings of Douglas Fir and Lodgepole Pine, 2,4-D and 2,4,5-T proved more toxic than MH, dalapon or neburon, 2,4-D causing the most rapid injury. MH at 50 p.p.m. caused inhibition of Pine shoots 3 weeks after application. Neburon and simazine, both at 2 and 4 lb./acre, gave excellent weed control without injury to potted transplants of *Taxus media hicksi*. Bare-rooted, 3-year-old transplants of Sugar Maple were not injured by simazine at rates of 4 and 8 lb./acre one month after transplanting.

4464. HOLM, L., TAYLORSON, R., and PINNEY, T. **Weed control in nursery plantings.** *Abstr.* in *Proc. 14th ann. Nth. Cent. Weed Control Conf.* 1957 (50–1) O.R.E.

Pre-flushing sprays were tested on seedling transplants of *Pinus sylvestris*, *Pseudotsuga taxifolia*, *Thuja* sp., *Picea pungens* and *Ribes alpinum*, as follows (dosages per acre): simazine 1 and 2 lb., CDAA 4 lb., CDAA 4 lb. plus dalapon 5 lb., CDAA 4 lb. plus diuron ½ lb., dalapon 5 lb., diuron 1 lb., diuron ½ and 1 lb. plus dalapon 5 lb., diuron ½ and 1 lb. plus sesone (Na 2,4-dichlorophenoxyethyl sulphate) 4 lb. The Pine was slightly injured by simazine and dalapon and *R. alpinum* was injured by diuron. CDAA and sesone caused no injury. The simazine and dalapon/diuron mixtures proved very effective.

4465. BURSCHEL, P. Untersuchungen zur chemischen Unkrautbekämpfung in Forstbaumschulen. **[Chemical weed control in forest nurseries.]** *Mededelingen van de Landbouwhogeschool en de Opzoekingsstations van de Staat te Gent* 23 (3/4), 1958 (1041–56). 5 refs. [G.g.] O.R.E.

Ten herbicides were tested for use in forest nurseries: (1) maleic hydrazide, (2) CDEC, (3) CDAA, (4) SES, (5) neburon, (6) TCA, (7) CIPC, (8) dalapon, (9) simazine, and (10) amino-triazole: The following applications before weed emergence were highly successful:—(9) at 1–2 kg./ha., (7) at 4–6 kg./ha., and (5) at 6 kg./ha. The other substances lacked sufficient residual effect. Germination of conifer seeds was retarded and reduced by (7), but not by the other preparations. Conifers treated immediately after sowing were more or less injured by all the preparations. Pot experiments showed that low dosages of (9) and rates of 6–8 kg./ha. of (5) caused little or no damage if applied after emergence. Transplants of Pine and Spruce were injured by (2), (3), (6), (8) and (10).

4466. URQUHART, B. **Weed control** *Scot. For.* 13 (2), 1959 (68–71).

Discusses the use of sheets of black polythene film (150 gauge) to control weeds in a plot of 2-year Norway Spruce transplants lined out at 2 × 7 in. Over one season, weeding took only 1·7 man-hours (excluding the time taken to cut and lay the sheets) per 1000 plants, compared with 3·05 on plots without the polythene. It appears that the polythene may also cause a slight increase in tree height growth. The film seems to be in good condition, despite a very wet summer (1958), and has not been disturbed or torn by wind. Trials continue.

232.326. Salvage of Overgrown Seedlings and Transplants. Root or Shoot Pruning etc.

4467. VLIET, C. VAN DER. O pinheiro brasileiro plantado de mudas com raizes cortadas. **[Establishing Paraná Pine from seedlings with pruned roots.]** *An. bras. Econ. flor., Inst. nac. Pinho* 10, 1958 (89–102). 13 refs. [Port.port.]

Araucaria angustifolia adapts itself with difficulty to transplanting to shallow soils or to soils with a high water table, because of the length of its main root, which, developing according to the length of the stem, may penetrate to a depth of 5m. This need for a deep soil is one of the reasons for its limited natural distribution. When the roots encounter obstacles, growth of the tree is checked. Such checking is exemplified in some of the plantatations at Monte Alegre belonging to the Industrias Klabin do Paraná de Celulose. A system of root pruning used at the company's nurseries is described. Seedlings 4 months old, that have reached a height of 5–8 cm., are lifted and their roots cut back to a length of ca. 3 cm. They are then transplanted to boxes of soil mixed with humus and at 10 months, at a height of ca. 22 cm., are planted out in their permanent positions. By this time the main root has sent out a quantity of auxiliaries, which enable the tree to thrive on shallow soils (at least 1·5 m. deep). In dry weather they may be ball planted, and in wet weather, with naked roots.

4468. SHOULDERS, E. **Root pruning boosts Longleaf survival.** *Sth. For. Note Sth. For. Exp. Sta.* No. 120, 1959 [1].

In tests in Louisiana, first-year survival was greatest (77% vs. 27% in controls) in plants undercut with a tractor-drawn fine, thin blade in June to 3–4 in. below bed level, and again in Nov. to a depth of 6–7 in., but plants deep-pruned once 2 or 3 months before lifting did nearly as well, and were easier to handle because of less root re-growth. [Cf. *F.A.* 19 No. 360.]

232.327. Protection Measures in Nurseries

See also Nos. 4708–9, 4769–70, 4772, 4775–6, 4911, 4934.

4469. **Nursery seedbed covers.** *Rep. For. Res. Inst. N.Z. For. Serv. 1957/58*, 1958 (16).

Owing to the cost of relatively frequent replacement of the scrim used for seedbed covers, tests with preservatives were started. A Cu-naphthenate preparation using mineral turpentine as a diluent gave promising results. It imparted a considerable degree of resistance to rot, substantially increased the percolation of rainwater through the treated scrim, and had no harmful effect on the *Pinus radiata* in the covered seedbeds. A further test, using salicylanilide as the preservative, is in progress.

4470. STEINER, H. Hochabdeckung von Saaten in Forstgärten. **[Raised covers for sowings in forest nurseries.]** *Allg. Forstztg.* 70 (5/6), 1959 (49–51). [G.g.]

Reed mats fastened to wires stretched between poles at a height of 2 m. were found to be much cheaper than traditional wooden covers and to make for better aeration, easier tending, less damage to seed by fungi and vermin etc. They withstood wind very well, though not hail.

4471. FRASER, J. W. **The effect of sunlight on the germination and early growth of Jack Pine and Red Pine.** *Tech. Note For. Br. Can.* No. 71, 1959. pp. 7. 2 refs.

Experiments in seedbeds given 0, 2, 4, 6 and 12 hours of sun daily showed that both species gave best germination with no sunlight, germination decreasing significantly when daily sunlight exceeded 4 hours and reaching a minimum for 12 hours. Height growth, on the other hand, increased with increased exposure to sunlight. Jack Pine grew better than Red Pine at all levels of exposure. [Cf. *F.A.* 17 No. 1354.]

4472. RAHTE, R. Frost-Schadensverhütung in Forstbaumschulen. **[Prevention of frost injury in forest nurseries.]** *Allg. Forstzeitschr.* 14 (6), 1959 (93–9). 13 refs. [G.g.]

Discusses ways to prevent or reduce damage by late frosts. In stressing the need for good and balanced nutrition, the author states that Douglas Fir was found to be less frost-hardy on soils with a high pH than on slightly acid oils, a fact thought to be due to Ca-K antagonism. The use of boron for frost protection [cf. *F.A.* 19 No. 1658; 20 No. 4709] is thought to be complicated in practice by the fact that its effectiveness depends on spraying when the foliage is completely dry and temperatures are ⩽ 18° C., and by the danger of injuries if the correct concentration and dosage are exceeded. The author discusses retardation of flushing by growth regulators, including an experiment in which the application of the [unspecified] herbicide Nexoval retarded flushing of 3-year-old Spruce transplants by 14 days, but does not consider such methods practical as yet. The one hopeful method is thought to be sprinkling with water, and this is discussed in some detail, including mode of action, equipment, frequency of application and amounts of water required, for which formulae are given. For plants 15–33 cm. high at a temperature of − 8° C. and with a wind of 0·5 m./sec., 2 mm. precipitation/hour would be required. The cost of the installation would be DM.10,000–15,000/ha.

232.328. Vegetative Propagation

See also Nos. 4298–9.

4473. FRÖHLICH, H. J. Grundlagen und Voraussetzungen der autovegetativen Vermehrung. **[Basic principles and assumptions in vegetative propagation.]** *Silvae Genet.* 8 (2), 1959 (49–58). 13 refs. [G.g.e.f.]

Discusses, largely for conditions in the N. temperate zone: (1) season of taking cuttings, presenting a table illustrating standard phenological characteristics and the recommended seasons; (2) the natural occurrence of growth regulators in trees in relation to their application to cuttings; (3) methods of applying growth regulators to the cuttings in relation to the physiological condition of the cuttings and the growth conditions; (4) propagation conditions; and (5) clonal characteristics of the parent tree.

4474. MIYAJIMA, H. **[Study on the propagation of *Chamaecyparis obtusa* by cuttings (3rd report). Effects of some propagating media on rooting responses of cuttings.]** *Bull. Kyushu Univ. For.* No. 29, 1957 (81–96 + 2 plates). 18 refs. [Jap.e.]

[Cf. *F.A.* 13 No. 2945.] Examines the effect of (*a*) clay-loam, (*b*) clay-loam + sand, (*c*) volcanic black soil, and (*d*) vermiculite, on rooting %. There were no significant differences, but (*d*) seemed slightly inferior to the other media. With (*c*), more but smaller adventitious roots were noted than with the other media.

4475. ENRIGHT, L. J. **Effects of stock plant fertilization upon rooting of cuttings of *Picea abies*, *Pinus resinosa*, and *Pinus strobus*.** *J. For.* 57 (5), 1959 (336–8). 9 refs.

The beds in which the stock plants were grown were prepared with cottonseed meal at 1000 lb./acre and a 4–12–4 fertilizer at 500 lb./acre. During the early spring of their first year, the seedlings were also given a top dressing with the same materials (2 parts meal to 1 part of the 4–12–4 fertilizer) at 500 lb./acre. Cuttings taken during the third year of growth responded to several root-inducing chemicals far better than controls, the % take being higher, and rooting considerably quicker. Concentrated indolebutyric-acid dips stimulated rooting most.

4476. CRAM, W. H. **Nursery research: maturity of Poplar cuttings.** *Rep. Dom. For. Nursery Sta. Sask. 1958*, [1959] (10).

Cuttings taken (*a*) on 9 Oct. and (*b*) on 29 Oct., stored out of doors and planted in the following May, did not differ significantly in moisture content, but (*b*) gave much superior establishment (53·5 vs. 42·7%) and height growth 112 days after planting (45·1 vs. 29·6 cm.).

4477. BLOOMBERG, W. J. **Root formation of Black Cottonwood [*Populus trichocarpa*] cuttings in relation to region of parent shoot.** *For. Chron.* 35 (1), 1959 (13–7). 1 ref.

Shoots of one-year-old *P. trichocarpa* were collected just after breaking of dormancy from a nursery at Lulu Island, British Columbia. The shoots were divided into four sections of equal length and placed in an atmosphere of 100% relative humidity at a constant temperature of 4° C. After one month the quarters were sampled to determine the number and length of adventitious roots formed and the number of new shoots. Significant differences were found in the number and length of roots produced in different quarters of the shoot but not in the number of new shoots. There were also significant differences in root length between clones. The most numerous and longest roots occurred on the lowest quarter of the shoot, decrease being acropetal. The data suggest better performance for cuttings of *P. trichocarpa* from the lower portions of the shoot and the importance of vigour in individual clones. *From author's summary.*

4478. CHARDENON, J., and TARIS, B. Action d'un organomercurique et d'un dérivé nitré du phénol sur le développement de boutures de *Populus*. Quelques remarques sur la reprise de l'activité cambiale chez les *Populus*. **[Action of an organomercuric substance and a nitro derivative of phenol on the development of Poplar cuttings. Some remarks on the resumption of cambial activity in Poplars.]** *C.R. Acad. Agric. France* 45 (4), 1959 (138–40). [F.] A.P.B.

In connexion with the chemical control of *Dothichiza populea* and *Cytospora chrysosperma*, two fungicides (1) methoxyethylmercuric chloride, and (2) dinoseb (1, 2 and 5%) were tested for their effect on growth of cuttings of 4 cultivars of *Populus × canadensis* and 1 of *P. deltoides*. In general (1) at 1 and 2% had a favourable effect on growth, but some retardant effect was noted at 5% and at all concentrations of (2). Observations so far indicate that cambial activity begins as soon as the cultivars are placed in favourable temperature, light and humidity, and in a medium containing a certain amount of nutrients.

4479. GÜNTHER, H. Untersuchungen über die vegetative Vermehrung des Hirschkolbensumach (*Rhus typhina* Torner). **[Researches on the vegetative propagation of the Stagshorn Sumach (*R. typhina*).]**

Arch. Forstw. 7 (10/11), 1958 (828–47). 3 refs. [G.g.russ.e.]

Vegetative propagation is important because this species is dioecious and inherently variable in tannin content [cf. *F.A.* 18 No. 2751]. When plants are pulled out, prolific regeneration from root suckers follows. Results of tests (1949–55) are tabulated for time taken to sprout, % sprouting, survival, height growth and for dry weight of foliage as affected by length and diameter of root cuttings and depth at which they were planted horizontally in light loamy sands. Cuttings should be ≮ 5–10 cm. long and laid ≮ 3 and ≯ 5 cm. deep. Those with diameter of 7–15 mm. develop taller plants with more leaves than those of 3–6 mm. Pilot tests with growth regulators indicate the possible use of Belvitan. An attempt to use green shoot cuttings from these root cuttings was only partially successful.

4480. FARRAR, J. L., and McJANNET, W. D. **Air-layering of Eastern White Pine (*Pinus strobus* L.).** *For. Chron.* 35 (1), 1959 (18–21). 6 refs.

These are believed to be the first experiments in air-layering on this species. In the first, using 96 potted 6-year plants, 70% of air layers had developed ⩾ 1 root after 14 weeks; in the second, using 14 wildings, 10–15 years old, 86% of layers were rooted after 14 weeks. IAA or IBA were used to promote rooting.

4481. GARNER, R. J. **The grafter's handbook.** Faber & Faber Ltd., London. 2nd ed. (rev.) 1958. pp. 260 + 32 photos. 143 refs. Price 25*s*.

The arrangement is the same as in the first edition [see *F.A.* 10 No. 2447] but many new methods and devices are included.

4482. FOWLER, D. P. **A summer field grafting technique for Pine.** *For. Chron.* 35 (1), 1959 (30–5). 5 refs.

In order to extend the grafting season (usually spring and early summer) into mid-July, experiments were made in cleft grafting using a number of protective substances and methods. *Pinus thunbergii*, *P. tabulaeformis*, and *P. hwangshanensis* were grafted on to *P. mugo* stock, and *P. peuce* on to *P. strobus*. Grafts were protected by an inner bag of glassine, polyethylene or pliofilm, and an outer 'shade' bag of wet-strength or double kraft paper. The use of an asphalt emulsion was also tested, but was found to have a detrimental effect. The best results were obtained with a pliofilm inner bag, which disintegrates after 1–2 months, especially when enclosed in a wet-strength kraft 'shade' bag, thus avoiding the necessity of cutting open the bags to facilitate hardening off. By this method 96% success was achieved with grafts made on 16 July.

232.329. Miscellaneous (including Greenhouses, Frames, Raising in Pots, Tubes etc.)

See also No. 4467.

4483. JOSHI, D. P. **Note on transplanting of Sal (*Shorea robusta*).** *Indian For.* 85 (5), 1959 (301–4 + 1 photo).

S. robusta is generally supposed not to stand planting out, and artificial regeneration is usually by direct sowing. Experiments have shown, however, that 1-year seedlings transplanted into baskets and kept irrigated for some weeks, can be successfully planted out after the break of the monsoon. Some success was also obtained with ball stock, taken from the nursery, wrapped in grass, and planted in pits as soon as possible.

4484. NAGARATHNAM, S. **'Alkathene' containers.** *Indian For.* 85 (4), 1959 (249–50).

A note on the use of containers made of this plastic material manufactured by I.C.I., as an alternative to Bamboo baskets or earthen pots for raising planting stock. Costs are Rs.3·75 per 100 compared with Rs.7–10 for baskets or pots.

4485. FRÖHLICH, H. J. Torfkulturen in der Forstwirtschaft. **[The uses of peat pots in forestry.]** *Forst- u. Holzw.* 14 (6), 1959 (122–9). 8 refs. [G.]

Discusses water absorption by, and losses from, various kinds and sizes of peat pot used in forestry, and mentions numerous examples of their use in afforesting dry, difficult sites, e.g. on shell limestone, granite, and sand dunes, with some discussion of costs.

4486. MÜLLER, J., and MÜLLER, Z. Stimulační účinek herbicidu Dikotex na borové semenáče (*Pinus silvestris* L.). **[The stimulating effect of the herbicide Dikotex on *P. sylvestris* seedlings.]** *Sborn. čsl. Akad. zeměd.* (*Lesn.*) 3 (1), 1957 (17–20). 8 refs. [Cz.]

Dikotex, an aqueous solution of the Na salt of MCPA, was applied in early June to 1 × 1 m. trial beds of 1-year Pine seedlings at 0·004, 0·008, and 0·012% concentrations (i.e. 0·1, 0·2 and 0·3 g. active principle per bed). Statistically evaluated results showed that the lowest concentration stimulated height growth best, while concentration ⩾ 0·016% retarded it. The differences in growth caused by the various dosages still persisted 9 months later.

232.33. Formation of Stands by Direct Sowing

4487. CARLBORG, G. Nykonstruerad såddapparat. **[A newly-constructed sowing apparatus.]** *Skogen* 46 (5), 1959 (118–9). [Sw.]

The portable apparatus (described and illustrated) was designed by G. Larsson, Pajala, and comprises a basal steel ring, which is pushed down into the humus layer, a spoon-shaped implement, controlled by a foot-operated lever, which moves the humus on the seed spot to one side, and the seed container which allows the passage of variable amounts of seed. The seed is expelled toward the edge of the seed-spot, and then lightly covered. The apparatus weighs less than 9 kg. and can be made lighter. In direct-sowing experiments in Norbotten, 3250 seed-spots, on an area of 1 ha. were sown per man and per day, roughly ¼ of the time needed for hand-sowing.

4488. KREWAZ, J. **A standard for spot seeding.** *For. Chron.* 34 (4), 1958 (380–1).

The tables presented have been constructed for use in direct sowing, where the object is to deposit one or more viable seeds on each small spot selected for sowing. As seed lots vary in viability, it is desirable to know the minimum number of seeds per spot required at different viabilities to provide each spot with a specified number (1–5) of potentially productive seeds.

4489. HAIG, R. A. **Result of an experimental seeding in 1920 of White Spruce and Jack Pine in Western Manitoba**. *For. Chron.* 35 (1), 1959 (7–12). 7 refs.

In 1920, varying amounts of seed of *Picea glauca* and *Pinus banksiana* were sown on ¼-acre plots on a well prepared seedbed of mineral soil that had previously supported a sparse stand of Aspen, Birch and Willow. Both species germinated well, but by 1957 most of the Pine had disappeared (probably as a result of rabbit damage), while the Spruce was dense and thrifty.

4490. MANN, W. F., JR. **Industry tests Loblolly direct seeding**. *Forests & People, Alexandria, La.* 9 (1), 1959 (22–3, 30–2).

Summarizes results of 18 pilot-scale tests of direct sowing of *Pinus taeda* in Louisiana on very varied sites, at rates ranging from 0·25 to 1·5 lb./acre, with and without soil preparation by hand and from the air, the seed being treated with different combinations of repellents. Weather was very favourable and 1st-year seedlings varied from ca. 2000 to 11,000 per acre.

4491. WAGAR, J. A., and MYERS, C. A. **Some factors affecting the results of direct-seeding Ponderosa Pine in the Black Hills**. *Res. Note Rocky Mt. For. Range Exp. Sta.* No. 33, 1958. pp. 6.

Sowings made between 1905 and 1953 over a total of 15,933 acres were examined in 1956–57 to determine reasons for success or failure. Sowings were most successful if done during years of relatively abundant precipitation. Stocking was best where soil moisture conditions were most favourable e.g. on moist N. and E. aspects, and poorest on upper, steep S. and W. aspects. Results were poor on eroding or shallow soils. Pines competed successfully with grasses and forbs in years of abundant precipitation but not during dry years, and not with Aspen, Oak or Birch. It was not possible to determine the influence of rodent-control methods, seed source or sowing methods on subsequent stocking. *From authors' summary.*

4492. LAVENDER, D. P. **Effect of ground cover on seedling germination and survival.** *Res. Note Ore. For. Lds. Res. Cent.* No. 38, 1958. pp. 32. 34 refs.

A study was made on an area of the Tillamook Burn, devastated by 4 major fires between 1933 and 1951, to determine how far the success of direct sowing from the air is affected by the mechanical barrier of fallen leaves from deciduous shrubs or competition from growing herbaceous vegetation. Cover intensity in the experimental area varied from light (0–33% of ground surface covered by living plant material) to medium (33–66%), to heavy (66–100%). Leaf litter was found to have no deleterious effect, and though herbaceous cover may tend to delay germination, it does not always affect the final germination % or total seedling survival. *From author's summary.*

4493. SPENCER, D. A. **Prevention of mammal damage in forest management**. *Proc. Soc. Amer. For.* 1958 (1959), (183–5). 11 refs.

Discusses chiefly research on tetramine. When Douglas Fir seed was treated by coating, or by moist-cold storage in vermiculite mixed with the compound, or by planting in treated soil, the endosperm became repellent to deer mice and lethal to meadow mice, and emerging seedlings remained protected for several weeks. Protection of Douglas seedlings planted in treated soils has so far lasted for 3 growing seasons in tests against rabbits, and seedlings planted 1 year after treatment were also protected. Though the tetramine is extremely toxic, feeding tests with rodents and their predators showed that animals usually stop eating before receiving a lethal dose. No phytotoxic effects were observed.

4494. **Bird-repellent seed dressings.** *Rep. For. Res. Inst. N.Z. For. Serv. 1957/58*, 1958 (15–6).

Results from a pilot nursery trial indicate that anthraquinone compound has considerable powers as a deterrent to bird attack when applied to *Pinus radiata* seed, and also appears appreciably to reduce the severity of post-emergence attack on young seedlings. A cold emulsifiable asphalt was used as a sticker, and while this did not affect the germination of stratified *P. radiata* seed, it proved unsatisfactory with stratified *Pseudotsuga taxifolia* seed. Red-lead powder dusted on to water-moistened seed was also tested, and found to be only slightly less effective, both in preventing seed damage and in lessening post-emergence attack on seedlings. Red-lead powder in itself had no effect on germination. There seem to be grounds for supposing that any abnormal colour imparted to seeds provides a certain immunity to bird attack, and this idea is being tested. A small field trial of direct sowing showed that anthraquinone seed dressing had no repellent effect on field mice, and red lead possibly only a slight effect.

4495. STREETS, R. J. **Some factors affecting artificial regeneration of *Pinus nigra* var. *caramanica* (Troödos Pine) at Prodromos, Cyprus.** *Emp. For. Rev.* 38 (1), 1959 (84–7).

Seed was sown in 1954 on 2 series of 4 plots (at ca. 4500 ft. alt.) having different aspects or different degrees of side-shade. Birds and mice killed many seedlings initially, causing some plots to be re-sown. Damping-off, and more especially desiccation, killed most seedlings and in neither series was regeneration satisfactory, though survival was much higher in the shaded series (6·8% of the maximum vs. 2%). Survival was best on the most shaded plot and losses were heaviest and quickest on W. and S. aspects. A close correlation between evaporimeter readings at 2 ft. above ground and rate of survival was observed. It is suggested that evaporation may be more significant for seedling survival than temperature, and that seedlings are therefore more sensitive to the combined effects of temperature, humidity and wind on water-loss than to the 'sun-scorch' effect of high soil temperature.

4496. GUINAUDEAU, J. Une expérience d'emploi d'engrais dans un reboisement par semis de pin maritime à Mimizan (Landes). **[An experiment in the use of fertilizers in direct sowing of *Pinus pinaster* at Mimizan (Landes).]** *Rev. for. franç.* 11 (4), 1959 (310–6). [F.]

As a preliminary to these experiments, a study was made of the vegetation and soils of the area. Two types of *lande* were distinguished: (*a*) dry *lande*, mainly *Calluna vulgaris* with some *Erica cinerea* and *Ulex europaeus* and much *Pteridium aquilinum*; (*b*) moist *lande* with dominant *Molinia* and some dwarf gorse. A distinct difference was found in the water table, which was at a depth of > 60 cm. in (*a*) and at 35–65 cm. in (*b*). In (*a*) there is a thick humus layer and invariably an iron pan to a considerable depth; in (*b*) the humus layer is thinner and the iron pan less continuous and less deep. The pH of the A horizon was always < 5 in (*a*) and >5 in (*b*). The C/N ratio in (*a*) was 39 in the A_1, 35 in the B_1, and 30 in the A_2 horizon; in (*b*) on the other hand, the C/N ratio did not vary between horizons and never exceeded 25. The whole of the experimental area was first cleared by a brush cutter, and fertilizer was then spread and ploughed in before sowing with *P. pinaster*. The following treatments were applied in May 1957 (dosages given in kg./ha.): control (T), 400 urea-formaldehyde (N), 1500 basic slag (P), 400 urea-formaldehyde + 1500 basic slag (NP), 400 urea-formaldehyde + 500 KCl (NK), 1500 basic slag + 500 KCl (PK), 400 urea-formaldehyde + 1500 basic slag + 500 KCl (NPK). There was no observable difference between plots in the first year, but by Oct. 1958 mean height of Pine in cm. on the different plots was as follows: (T) 35·9, (N) 44·5, (NK) 35·6, (P) 57·8, (NP) 71·4, (PK) 57·5, (NPK) 78·7. The results for each treatment were remarkably uniform on all plots (5 each) [no apparent difference between (*a*) and (*b*) in this respect].

232.4 Formation of Stands by Planting

See also Nos. 4423, 5003.

4497. Sonderheft Forstkulturen. **[Special number: Planting.]** *Forst- u. Holzw.* 14 (5), 1959 (89–110). Many refs. [G.]

Contains the following articles: Mechanical methods of establishing plantations on completely ploughed areas (*E. Burckhardt*) [an account of 12 years' practical experience in the Karlsruhe region and elsewhere]; Experience in the use of rotary cultivators and other powered implements for weed control in plantations (*Rosenstock*) [discussing also mowers, cultivators, soil-injection equipment etc.]; Experience with planting in bored holes in Grund forest district (*Jansen*); Planting Douglas Fir in peat blocks (*W. Sachs*) [demonstrating the advantages of the method, particularly on steep, stony talus slopes]; Machine planting (*W. Mix*) [with discussion of costs]; Reforestation in Spain (*U. Ammer*); Afforestation in the Emsland (*H. Barelmann*).

232.41. Planting Stock (Type, Handling and Treatment)

See also Nos. 4445–6, 4460–1, 4467–8, 4483, 4525.

4498. HAUGBERG, M. Foreløpige resultater fra et forsøk med planting av 2/0, 2/1, 2/2 og 2/3 gran. **[Preliminary results of a study on planting 2 + 0, 2 + 1, 2 + 2 and 2 + 3 Norway Spruce.]** *Årsskr. norske Skogplantesk. 1958*, 1959 (57–8). [Nor.]

Planting was done in spring 1956. By autumn 1958, 66·7% of the 2 + 0 plants were dead as a result of frost or grass competition, mortality in the transplants ranging from 4% in the 2 + 3 to 5·7% in the 2 + 1 plants. Mean heights in autumn 1958 for the 2 + 0 to 2 + 3 plants were respectively 22·6, 37·5, 44·2 and 42·7 cm. and top shoot lengths 7·4, 13·7, 16·8 and 13·5 cm.

4499. BERNTSEN, C. M. **A test planting of 2–0 and 3–0 Douglas Fir trees on a steep south slope.** *Res. Note Pacif. Nthwest. For. Range Exp. Sta.* No. 165, 1958. pp. 4.

Following the failure of natural seeding and planting of 2 + 0 stock, plantings of 2 + 0 and 3 + 0 Douglas were compared in W. Oregon on a slope of ca. 50% at 2000 ft. alt. After 2 years, survival was 51% for 3 + 0 and 33% for 2 + 0 stock, or, excluding plants that died in the first year before bud break, 56% and 40% respectively. The difference was largely accounted for by the ability of the larger trees to survive movement of surface material better. Height growth was the same for both.

4500. RAEDER-ROITZSCH, J. E. **Experiments in transplanting open [bare]-rooted Eucalypt seedlings.** *Aust. For.* 22 (1), 1958 (24–9 + 5 photos). 2 refs.

Comparative tests of bare-rooted and tubed planting stock of *Eucalyptus viminalis*, *E. dalrympleana*, *E. robertsoni*, *E. perriniana*, *E. pauciflora* and *E. stellulata* were made in connexion with planting for erosion control in the Snowy Mountains. It was shown that under certain conditions bare-rooted stock of the species tested could be used successfully for field planting, and that such stock is superior to tubed stock in ease of handling and transport and vigour of growth. The necessary conditions are that planting should be done during the winter months, that excess branches should be pruned and that the roots should be puddled in mud before transport.

4501. LAFFÈRS, A. Použitie stimulátorov 2,4 D a β-indolylacetikum, d'alej rašeliny a 'stratifikovaných' sadeníc pri zakladaní sosnových kultúr na viatych pieskoch. **[The use of 2,4-D and β-indolylacetic acid, and peat and 'stratified' seedlings in establishing Pine plantations on aeolian sands.]** *Lesn. Čas.* 5 (1), 1959 (71–8). [Slovak.]

One-year Pine seedlings (500 per variable) were planted out: (*a*) after soaking for 18 hours in 10, 50 or 100 mg./litre solutions of IAA or in (*b*) 0·2, 0·5, 1 or 2 mg./litre solutions of 2,4-D; (*c*) with a handful of peat in each planting hole; and (*d*) after 2 months of 'stratification', i.e. heeling-in in a hotbed. Percentage survival after the first growing season was: (*a*) 23·95–6·47 (i.e. decreasing with increasing concentration of acid; (*b*) 19·21–39·54 (i.e. increasing with the concentration); (*c*) 37·92; (*d*) 49·34; and on a control plot (*e*) only 9·02%. Data on height and diameter increment after one year are also given and discussed.

4502. DÖPPER, H. Papiertüten für Forstpflanzen bei Aufforstungen. **[Paper cones for forest plantings.]** *Allg. Forstztg.* 70 (5/6), 1959 (61–2). [G.]

Planting out or transplanting stock in soil-filled paper cones of the same shape and size as the planting hole, is stated to have been efficient and successful. In a small trial with 3-year-old Spruce planted near the timber-line on a S. slope, losses from drought were much less than in the rest of the afforestation area.

4503. ALDOUS, J. R. **Polythene bags for movements of forest nursery stock.** *Emp. For. Rev.* 38 (1), 1959 (65–76). 8 refs.

Recommendations based on Forestry Commission (Gt. Britain) field trials and experiments in 1956–58 [cf. *F.A.* 19 No. 342; 20 No. 242].

4504. LEECH, R. H. **A second look at a nursery stock packaging experiment.** *For. Chron.* 35 (1), 1959 (36–49). 1 ref.

In 1953 an experiment was established at Larose Forest, near Ottawa, which compared the survival of [*Pinus resinosa*] stock planted after storage in bales, without refrigeration or the addition of water, with the survival of stock planted after storage in crates under the same conditions [cf. *F.A.* 16 No. 1688]. In 1957, the plots were re-measured for both survival and height growth. The results have verified the earlier study, showing that the survival from crates was only slightly better than the survival from bales. The method of packaging did not affect height growth. Length of period of storage affects both mortality and height growth. *Author's summary.*

4505. SANDVIK, M. Vinterlagring av skogplanter i skur og på kjølelager. **[Winter storage of planting stock in a shed or in cold storage.]** *Norsk Skogbr.* 4 (8), 1959 (231–3). 5 refs. [Nor.nor.]

In 1956–57 and 1957–58 experiments were made in storing 2 + 0 Siberian Larch, 2 + 0 Pine, and 2 + 0 and 2 + 2 Spruce for 7 months in varying conditions. Larch stored on the earth floor of a shed with the temperature uncontrolled but never below freezing, and in a moist atmosphere, also with temperature uncontrolled, and Pine and Spruce stored at 1–4° C. with a relative humidity of 99–100% showed good survival. Storage at 0–2°, 80% r.h., caused drying out and heavy mortality of Larch and Spruce. Pine plants stored at 1–4°, 99–100% r.h., from 29 Oct. 1957 to 27 May 1958, grew twice as fast during the following growing season as plants transplanted straight from the seedbed after growth had begun.

4506. ARNBORG, T. Plantkondition och tillväxt: ett försök belysande 2/0 tallens skottutveckling och dess beroende av plantans behandling. **[Plant condition and growth: a study of shoot growth of 2 + 0 Pine and the effect on it of planting treatment.]** *Norrlands SkogsvFörb. Tidskr.* 1959 (1), (22–32). [Sw.sw.]

Presents results of shoot measurements during the first 2 seasons after transplanting for 2 + 0 Pine differently treated during transplanting. Shoot growth was better in plants lifted and replanted at once than in those lifted on 7 May and stored at 1·5° or at 8° C. until 17 June. Plants stored at 1·5° showed less mortality from heat and rather better shoot growth than those stored at 8°. Lifting for transplanting should begin as soon as the soil temperature reaches 5°, but plants should not be lifted until immediate replanting is possible.

4507. STONE, E. C., and SCHUBERT, G. H. **Ponderosa Pine planting stock.** *California Agriculture, Berkeley* 13 (3), 1959 (11–2).

Two-year-old seedlings were lifted at 15-day intervals from 15 Sept. to 1st Dec., replanted in the greenhouse after 0, 1, 2, or 3 months' cold storage, and examined 30 days later for survival and root development [cf. *F.A.* 20 Nos. 4460–1]. Survival % improved for successive lifting dates up to Nov. 1st, and decreased for each month of storage, particularly for the early batches. Thus of the first two, none survived after 3 months' storage, of the last three nearly all did. Root elongation followed a similar pattern, but for the later batches root growth was better after 3 months' storage than after 1 or 2 months, though not so good as that produced by immediate planting.

232.42. Methods of Planting (including Use of Fertilizers etc.)

See also Nos. 4497, 4501, 4526, 4546, 5401.

4508. CALLIN, G., and HANSSON, J.-E. Plantering av tall och gran. En jämförande arbetsstudie av manuelle metoder. **[Planting Pine and Spruce. A comparative work study of manual methods.]** *Medd. SkogsforsknInst., Stockh.* 48 (8), 1959. pp. 76. 4 refs. [Sw.sw.g.*g*.]

Covers studies already reported [see *F.A.* 17 No. 2746] and later tests, mainly on the influence of complicating factors such as stony ground and large root systems, including a points table for piece-work rating in work with the SFI mattock, whose suitability was confirmed. A special study of supplementary plantings was made, suggesting that cheaper original planting methods (particularly smaller scalped patches) may be preferable even if survival is slightly poorer. Survival and growth were better with scalping than without, but size of scalped patch made little difference.

4509. MORK, E. De viktigste faktorer som har betydning for resultatet etter planting av gran. **[The most important factors affecting Spruce planting results.]** *Norsk Skogbr.* 4 (8), 1959 (219–22). [Nor.]

Gives practical advice on e.g. planting material, handling, tools, plant spacing, and wages (contract vs. piece rates), and presents tabulated results, from the latest inspection in 1959, of an experiment laid out in 1944; this shows rather higher survival from flat-root than from vertical-wall hole planting (82 and 78% mean survival respectively), and best survival and height growth for Spruce planted in early May and early August, and poorest results for those planted in mid-June, the total period covered by the planting experiment stretching from 8 May to 29 Sept. [Cf. *F.A.* 16 No. 428.]

4510. ARMSON, K. A. **The effect of two planting methods on the survival and growth of White Spruce (*Picea glauca* (Moench) Voss) in Eastern Ontario.** *For. Chron.* 34 (4), 1958 (376–9). 4 refs.

White Spruce trees were planted in the Larose County Forest, Ont., on a sandy soil with a permanent water table 6–24 in. below the surface. In method (1) the trees were placed in the bottom of the furrow, and in (2) on the upturned furrow slice. Eight years after planting there was no difference in survival rate, but in (2) height growth was significantly greater than in (1). The difference appeared to be related to the fact that the trees in (1) had their roots placed in a zone of the soil that is seasonally saturated with water. *From author's summary.*

4511. WILDE, S. A., and VOIGT, G. K. **The effect of different methods of tree planting on survival and rate of growth of White Pine on superior clay soils.** *For. Res. Note Wis. Coll. Agric.* No. 43, 1959. pp. 2.

Tests were made of planting (*a*) on scalped patches, (*b*) at the bottom of the furrow, and (*c*) on top of the furrow slice; after 6 years, survival was respectively 60·7, 36·6, and 85·1%, mean height 28·7, 26·2, and 35·0 in.

4512. PRÜFERT. Aufforstung von Jura-Steilhängen mit Hilfe von Torfkeilen. **[Afforestation of steep slopes in the [German] Jura using peat wedges.]** *Allg. Forstzeitschr.* 14 (10), 1959 (212–4). 4 refs. [G.]

Describes successful reforestation on very permeable, dry calcareous sites with little or no soil, near Sigmaringen, Wurttemberg. Saddle-shaped pieces of solid peat, weighing ca. 90 g.when dry and up to 1000 g. when soaked, were placed at the bottom of prepared plant holes, the plants placed on top with thin roots spread out, and the holes filled with soil. These clods of peat gave better results than comminuted or pressed peat, and were cheaper to transport than peat pots. *Picea omorika* showed particularly good early growth.

4513. LHOTSKÝ, J. Vliv různého způsobu zaorání ústrojné příměsi na úpravu kapilárního potenciálu písčitého profilu. **[The influence of different methods of working organic fertilizers into sandy soil on its capillary potential.]** *Sborn. čsl. Akad. zeměd.* (*Lesn.*) 5 (4), 1959 (395–408). 13 refs. [Cz.cz.russ.g.]

A study was made of the effect on the capillary potential of applying (1) raw humus + forest weeds, and (2) peat, by two methods: (*a*) burying the material in a single layer, and (*b*) mixing uniformly with the mineral soil. Method (*a*) was unsuitable, as it reduced the capillary potential and thus indirectly impaired the rooting of young plants (Pine and Oak). The organic matter should be applied to a depth of 40–50 cm.

4514. JONÁŠ, F. Vliv lupiny na dusík a dusičnany v půdě ve větrolamu v Obříství u Mělníka v letech 1954–1956. **[The influence of lupins on the N and nitrates in the soil of the Obříství u Mělníka shelterbelt 1954–56.]** *Sborn. čsl. Akad. zeměd.* (*Lesn.*) 5 (4), 1959 (409–26). 10 refs. [Cz.cz.russ.g.]

Comparison of plots, (*a*) sown with lupins inoculated with nodule-forming bacteria, (*b*) sown with non-inoculated lupins, and (*c*) without lupins, showed that nitrates on (*b*) were more depleted than on (*a*), where also more organic matter with a higher N content was formed. During the lupins' flowering period, nitrate contents on (*a*) and (*b*) fell below that on (*c*) but increased towards the end of the growing season, owing to nitrification of the dying subterranean parts of the lupins. Height-increment data of 1950 for trees and shrubs in the shelterbelt showed that Oak did better on plots with lupins, whereas *Tilia* sp. did not.

4515. DOMINIK, T. Próby przeszczepiania mikrobocenozy glebowej drzewostanów sosnowych na tereny rolne. **[Experiments in inoculating ploughed land with mycorrhizae from Scots Pine stands.]** *Prace Inst. bad. Leśn.* No. 177, 1958 (5–43). 20 refs. [Pol.russ.g.]

Field plots of Pine seedlings were inoculated with soil from (*a*) a young, (*b*) an old Pine stand, or (*c*) left without inoculation. Findings included the following: (*b*) gave better inoculation than (*a*); unwanted organisms, e.g. *Fusarium* spp., were transferred to the plots via the inoculum; and seedling and mycorrhiza development were better on the more fertile soils. General conclusions were that: inoculation of field plots with forest soil does not ensure good seedling survival or development; many field soils contain fungi of their own, capable of forming mycorrhizae on Pine; a positive correlation exists between the thickness of the mycorrhizal mat and the luxuriance of seedling growth; in afforestation of ploughed land, or land that has not previously carried Pine, direct sowing should be avoided, plants from forest nurseries being used so as to ensure the transference of mycorrhizae to the new soil.

232.43. Spacing and Arrangement in Plantations

See also Nos. 4353, 5003–4, 5013.

4516. NYLINDER, P. Synpunkter på granvirkets kvalitet med hänsyn till sulfitprocessen. **[Aspects of Spruce wood quality with reference to the sulphite process.]** *Repr.* from *Svensk PappTidn.* 61 (18*B*), 1958 (712–7). 7 refs. [Sw.sw.e.g.]

Presents data on the effect of plant spacing on e.g. knot content, branch thickness, weight of dry matter [cf. *F.A.* 20 No. 3125] and concludes that for the sulphite pulp industry differences caused within the range of spacings of 1–2 m. are of minor importance.

4517. BALDWIN, H. I. **Growth of Red Pine at different spacings. Second report.** *Fox For. Note* No. 70, 1958. pp. 2. 1 ref.

[Cf. *F.A.* 10 No. 2566; 20 No. 4562.] Gives enumeration data 23 years after planting for 7 spacings. Though total production was greatest in the densest stands (4 × 4 ft.) and least in the most widely spaced (8 × 8), the latter had the highest mean d.b.h. and the greatest number of trees of 8 in. d.b.h./acre, thus confirming the trend shown earlier. Dominant heights were about equal.

232.44. Season and Time of Planting

See No. 4509.

233. Afforestation

See also Nos. 4073, 4098, 4107, 4497 *et seq.*, 4549, 5401, 5425–7, 5452.

4518. Masini, G. I rimboschimenti dell' Isola d'Elba: considerazioni sulle specie legnose impiegate. **[The afforestation of the Isle of Elba: notes on the woody species used.]** *Monti e Boschi* 10 (1), 1959 (10–8). [It.f.e.]

The most successful species is *Pinus pinea*, followed by *P. pinaster*, *P. nigra* var. *calabrica*, *P. canariensis* and *P. radiata*. Mixtures of Pines with *Quercus ilex* are successful on good sites. [Cf. *F.A.* 18 No. 309.]

4519. Bauer, P.-P. von. Waldbau in Südchile. **[Afforestation in S. Chile.]** *Bonner Geographische Abhandlungen, Bonn* No. 23, 1958. pp. 120 + 18 photos, 2 maps. 37 refs. [G.span.]

Gives a detailed account of the geology, climate (characterized by sharp spring frosts), soils (mainly of volcanic origin), and hydrology of a site on a private estate near the E. shore of Lake Llanquihué, and of afforestation experience there: nursery work, started in 1949, including control of pests such as finches, rodents, etc.; choice of species, with *Pinus radiata* the best, groups of *P. pinaster* and *P. sylvestris* moderately successful, but many other conifer failures. Full details of site preparation and planting of *P. radiata* (2 × 1 and 2 × 2 m. spacing) are given; losses from all causes after 3 years totalled 8·3%. From 1950 to 1956 inclusive, 300 ha. were planted. Data are also given on: a forest fertilizing experiment in which P + K (2/1) gave good results; mycorrhizae—only *Boletus luteus* has so far been found; and forest pests.

4520. **Tree growth on deep peat.** *Rep. Macaulay Inst. Soil Res. 1957/58*, [1959] (44–5).

Use of the pressure-membrane apparatus to investigate the tensions at which moisture is held in peat under trees suggests that, although a reserve of available moisture still exists in the relatively dry peat under the largest trees, temporary moisture shortage may be experienced during a dry summer. An investigation has been started on the marked effect of plough ridge depth on the early growth of *Pinus contorta* and Sitka Spruce on peat at Wauchope Forest, where growth on the high ridges from single mouldboard ploughing has been noticeably better than on low ridges thrown up by the double mouldboard. Since needle analysis in 1957 showed higher N contents in the larger trees, monthly determinations of moisture, NH_3–N, and NO_3–N in the peat from the rooting zones in both types of ploughing were made during the 1958 growing season, and these showed consistently higher values for moisture and NH_3–N in the deep ridges.

4521. Hart, G. E., and Byrnes, W. R. **Performance of trees planted on coal-stripped lands in the bituminous region of Pennsylvania.** *Res. Pap. Pa. St. For. Sch.* No. 28, [1959?]. pp. 2.

A preliminary report, summarizing data on height growth, survival, vigour etc. after 10 years, for 16 species planted on 22 sites. Best results generally were obtained with hybrid Poplar, Black Locust, Red Oak, Japanese Larch, Jack Pine and Scots Pine planted in groups of at least 5–7 rows per species.

4522. Boyce, S. G., and Merz, R. W. **Tree species recommended for stripmine plantations in Western Kentucky.** *Tech. Pap. Cent. St. For. Exp. Sta.* No. 160, 1959. pp. 12.

Robinia pseudoacacia and *Platanus occidentalis* had the best survival and height growth, after 10 years, of the hardwood species tried. Of the Pines, *P. taeda* showed by far the best growth. Survival and growth varied widely between species and sites, and notes are given on the suitability for planting of each of the 12 species tested, either pure or in mixture with *R. pseudoacacia*, according to site.

4523. Schiechtl, H. M. Die Grundlagen der Grünverbauung. **[Bases of erosion control by revegetation.]** *Mitt. forstl. VersAnst., Mariabrunn* No. 55, 1958. pp. 273. 211 refs. [G.]

A fully illustrated treatise, mostly on landslides, earth cuttings and torrent erosion in the Alps, based on the author's work on 57 (listed) projects in the Tyrol, and extensive, mostly German, literature. Part I, on choice of species, includes reports on many trials with both non-woody and woody plants, among them various Willows, for tolerance to soils and climatic extremes, snow, burying etc., propagation, root and surface growth; Part II covers techniques, e.g. formation of artificial and live barriers, natural success of species, and afforestation; Part III covers tending and aftercare, including legal protection of erosion-control works; and Part IV recommends species and methods for various ecological conditions.

4524. Beplanting en recreatie in de Haagse duinen. **[Forest planting and recreation in the [Meyendel] dunes near The Hague.]** *Meded. Inst. toegep. biol. Onderz. Nat.* No. 39, 1958. pp. 126 + 32 photos + pp. 108 + 2 maps. 118 refs. [Du.e.]

Meyendel is an area of dunes used as a catchment and recreation area for The Hague. The report contains the following papers: The vegetation of Meyendel (*J. H. A. Boerboom*) [covering the composition and distribution of the plant communities, and vegetation mapping]; Recreation in Meyendel (*A. Coops*) [an analysis of the numbers and behaviour of visitors]; The importance of Meyendel as a nature reserve for all Dutch dune areas (*V. Westhoff*); Bases for a planting plan (*V. Westhoff* and *H. Otto*); The technical aspect of planting in dune areas (*H. Otto* and *A. Stoffels*); Growth on and landscape of the dunes near Scheveningen and Wassenaar from ca. the year 1300 to the present day (*J. H. A. Boerboom*).

4525. Krefting, L. W. **Survival and growth of some wildlife cover plantings in Minnesota.** *Minn. For. Note* No. 79, 1959. pp. 2.

In order to improve the winter habitat for deer and grouse, 5 experimental conifer plantations were made in the spring of 1934 on the N. shore of Lake Superior—3 of them with wilding Balsam Fir 6–8 ft. high, and 2 with wilding Spruce (Black and White) ca. 6 ft. high. A study of these plantations shows that it is possible to transplant large wilding Balsam Fir and Black and White Spruce successfully. Survival was high in all cases. Observations indicate that the best winter protection and use of the cover plantings by game is obtained when the plots are $\nless \frac{1}{10}$ acre in size, and spacing is 4 × 4 ft.

4526. Scheer, R. L. **Comparison of Pine species on Florida sandhills.** *J. For.* 57 (6), 1959 (416–9). 12 refs.

[Cf. *F.A.* 20 No. 4368.] On a site cleared of vegetation by a rootrake-scalper, Slash, Loblolly, Longleaf and Monterey Pine were hand- and machine-planted, and Shortleaf Pines hand-planted, in 1954. Survival and height increment for four growing seasons are presented. Survival in 1958 of Slash, Loblolly and Shortleaf was then 92, 93 and 88%, of Longleaf 32%, and of Monterey almost nil. Height averaged: Slash 5·9, Loblolly 4·4, Shortleaf 3·5 ft. Only with Longleaf did hand planting give better first-year survival than machine planting. Only Slash Pine has remained relatively free from insect pests and disease, and it is so far the best of the species tested. A further test, now under way, will compare Sand, Slash, Loblolly and Longleaf Pines on sandhill sites prepared with a drum-type brush chopper; the Longleaf will be protected from brown-spot needle blight (*Scirrhia acicola*) by spraying.

4527. Rosayro, R. A. de. **Afforestation for protection and conservation in the up-country patanas.** *Ceylon For.* (*n.s.*) 3 (1), 1957 (50–68). 29 refs.

The montane region of Ceylon, comprising appreciable extents of undeveloped grassland or patanas has received the particular attention of the Forest Department in its programme for the development of the region. From considerations of the climate of the Dry Patana Zone, especially of the region of the Uva Basin (altitudinal limits 2000 to 5000 feet), the necessity for a comprehensive scheme of shelterbelts has been demonstrated; the climatic regime in this region is analysed and available data on wind velocity are given to indicate that such protection is essential to any planned land-development in the region. The technique of shelterbelt planting, with special reference to research and investigations carried out in other countries, is briefly reviewed and the results of shelterbelt planting in the Dry Patana Zone appraised on these lines. Techniques employed in shelterbelt planting in Ceylon are described and recent improvements effected by mechanization are mentioned. In general, the use of exotics, especially *Eucalyptus* spp., has proved most successful in afforestation schemes.

Afforestation for specific conservation measures in catchments and erodible land selected for special treatment are described. The results of afforestation covering a total of about 7000 acres in the up-country patanas provide the necessary foundation for the economic development of the montane region as a whole. *Author's abstract.*

235. Underplanting, Advance Planting etc. Nurses and Formation of Mixtures. Interplanting of Inferior Growth

See also Nos. 4391, 4549, 4748.

4528. Hall, F. C., Hedrick, D. W., and Keniston, R. F. **Grazing and Douglas-Fir establishment in the Oregon White Oak type.** *J. For.* 57 (2), 1959 (98–103). 17 refs.

A study to determine the best land uses for the Willamette Valley stands of poor *Quercus garryana* showed that Douglas Fir could be underplanted with considerable success; sheep grazing, if carefully and properly managed, was not incompatible with its establishment; increases in the weight of sheep were sufficient tentatively to justify grazing in the early stages of Douglas regeneration if other pastures were available as the main fodder source.

4529. Zakopal, V. Stav křivoklátskýh holin a význam březin pro jejich mikroklima—1. **[The state of the Křivoklát denuded areas and the importance of Birch for their microclimate. 1.]** *Sborn. čsl. Akad. zeměd.* (*Lesn.*) 4 (6), 1958 (471–90). 13 refs. [Cz.russ.g.]

[Cf. *F.A.* 20 No. 1794.] On each of three cleared areas (4, 22 and 61 ha.), four plots were laid out in Birch that had come in by natural succession (*a*), each plot carrying a different stage of Birch height growth (1, 2–4, 5–7, 7–9 m.). The soil and air temperatures, evaporation, precipitation, and soil moisture content of the plots were measured throughout the 1956 growing season, and compared with those of adjacent open areas (*b*). Before flushing, temperatures just above and below the soil surface fluctuated less in (*a*) than on (*b*). After flushing, evaporation was greater and the air at 10 cm. was warmer on (*b*) than in (*a*). In midsummer, a max. air temperature of 41·2° C. was noted at 10 cm. on (*b*), compared with ca. 32° in (*a*). Precipitation reaching the ground decreased with increasing height of the Birch; with trees of 7–9 m., it was 31·3% less than on (*b*). In spring, soil m.c. was greater, in the summer less, but in autumn again greater on (*b*) than in (*a*).

4530. Ferda, J. Použití přípravných a melioračních dřevin při zalesňování zabuřenělých kalamitních holin na degradovaných půdách těžkého charakteru. **[The choice of species to prepare and improve the site before afforestation on weedy cleared areas of degraded, heavy soil.]** *Sborn. čsl. Akad. zeměd.* (*Lesn.*) 4 (7), 1958 (553–68). 21 refs. [Cz.cz.russ.g.]

In trials at Křivoklát [cf. *F.A.* 18 No. 2828; 19 Nos. 2980–1], the effect on the soil was examined of (*a*) *Alnus glutinosa*, planted 1953, (*b*) self-sown Birch, 15 years, (*c*) [natural?] Spruce 13 years, (*d*) *Calamagrostis epigeios* on a control area, and (*e*) [natural?] Spruce, 70 years. The maximum capillary moisture capacity, aeration, pH, texture, C/N ratio, and humus content were determined. On gley-type podzols, *A. glutinosa* is the best species, though Birch will be better on the driest sites. Spruce quickly eliminates *C. epigeios* but causes no soil improvement, sometimes even the reverse.

4531. Broekhuizen, J. S. van. De invloed van loofhoutmenging op de groei van de Japanse lariks.

[The effect of an admixture of hardwoods on the growth of Japanese Larch.] *Ned. Bosb. Tijdschr.* 31 (6), 1959 (197–203). 9 refs. [Du.]

Height and volume measurements were made on a number of stands 30–35 years old on comparable sites, consisting of Larch (1) without hardwoods in the crown layer, but with a strong shrub layer covering at least 60% of the ground; (2) without hardwoods or shrub layer, but with grass; or (3) with hardwoods in the shrub and crown layer. Tentative conclusions are that some hardwoods in the shrub layer are desirable to suppress grass, but that too large a % of hardwoods in either the shrub or crown layer reduces increment of the Larch. A further study suggested that on moist sites there was little difference in increment between Larch mixed with American or with native Oak, but that American Oak should not be used on drier sites. Species recommended for use in mixture are native Oak, Beech, Hazel or Sweet Chestnut, at the rate of 4400 Larch and 2200 hardwood plants per ha.

4532. SCHAFFALITZKY DE MUCKADELL, M. Systematiske blandingsbevoksninger af eg/rødgran og bøg/rødgran. **[Systematic mixed plantations of Oak or Beech and Norway Spruce.]** *Dansk Skovforen. Tidsskr.* 44 (5), 1959 (287–333). 16 refs. [Dan.]

The use of mixed plantations in Denmark is briefly discussed and the Bjergsted 'chessboard' plantations, Jyderup, N.W. Sjæland, where Oak or Beech have been grown since 1935 in alternate squares of 6–9 m. side with Spruce, are described in detail. The aims of the method are to improve the value of the hardwood stands in their early stages, to increase the area of Spruce in the district without the disadvantages of pure plantations and to end with nearly pure hardwood stands after 60–70 years. A study of C. M. Møller's increment surveys for Oak and Beech suggests that on the site in question (site class 1·5 for Oak, 2 for Beech) the number of hardwood stems left at 70 years should be 4 on a square of 9 × 9 m. or 2 on one of 6 × 6 m. for Oak and 2·3 on one of 6 × 6 m. for Beech, the stems preferably standing near the edges of the squares to allow the crowns to close over the squares previously growing Spruce. Height measurements on the Oak/Spruce plantations, in plots 8–20 years old, are given in tables and diagrams; they show a satisfactory height increment, and on the two oldest plots very little difference in height between the two species; edge effects have not been great, but some Spruce crowns have been slightly suppressed by the Oaks. Other Danish Oak/Spruce mixtures (alternate rows, strips of several Spruce rows to one of Oak) and, more briefly Swedish, German and English experience are discussed. Measurements on the Beech/Spruce chessboard plantations established since 1938 show greater differences between the height of the two species than Møller's increment surveys show as normal for this site class; it is probable, however, that fairly heavy thinning of the Beech and, if necessary, some early felling in the Spruce, will encourage increased growth of the Beech. Other Danish Beech/Spruce mixtures, by rows and group plantings are discussed. General conclusions are that for a 50% mixture of Spruce with Oak or Beech the chessboard system, or alternate strips comprising e.g. 3 rows of each species, are preferable to alternate rows or alternate trees. If a greater proportion of Spruce is wanted, group or strip planting of Oak or Beech in the Spruce is recommended.

4533. Enrichissement suivant la méthode des placeaux discontinus. **[Enrichment of tropical forest by group planting.]** *Rapp. Inst. nat. Étude agron. Congo belge 1957*, 1959 (127). [F.]

Measurements were made of height growth of a number of species introduced in dense groups under thinned natural forest. *Lovoa trichilioides* was particularly successful, with a height m.a.i. of 100 cm., despite repeated loss of terminal buds by insect attack. Other good species were *Entandrophragma angolense*, *Blighia welwitschii*, *Afrormosia elata*, *Gossweilerodendron balsamiferum* and *Symphonia globulifera*.

236. Care of Regeneration or Plantations in the Initial Stages of Establishment

See also Nos. 4497, 4736 *et seq.*, 4958.

4534. BRUCE, D. **Effect of low competition on Longleaf Pine seedling growth.** *Proc. Soc. Amer. For.* 1958 (1959), (151–3).

In small-scale tests in S. Mississippi, scalping, and methods of burning that kill grass roots, particularly log burning, reduced competition and promoted growth more effectively than herbicides (allyl alcohol, TCA and others being tried). Brown-spot infection was often troublesome if not controlled, particularly on the plots without grass. Diameter at ground level at the end of the first year was a good indicator of probable start of height growth, and the need for measures to reduce competition.

4535. KLJUČNIKOV, L. JU. Primenenie gerbicidov dlja bor'by s sornjakami v nesomknuvšihsja lesnyh polosah. **[The use of herbicides for weed control in forest belts where the canopy has not closed.]** *Vestnik sel'skohozjajstvennoj Nauki, Moskva* 3 (12), 1958 (87–91). 7 refs. [Russ.e.g.] O.R.E.

Tests were made in young shelterbelts [species not stated] in 1956 and 1957, 2,4-D being sprayed in such a way that only the weeds and the lower parts of the trees were touched by the herbicide. The effects of the sprays and of mechanical inter-row weeding on *Convolvulus arvensis*, *Cirsium arvense*, *Mulgedium tataricum*, *Sonchus arvensis* and *Amaranthus retroflexus* are tabulated. The best method of weed control in the first 3 years (i.e. before canopy closure) is thought to be: mechanical weeding in late May, followed by herbicide application (2 kg. active principle/ha.) in mid-June, and mechanical weeding again in mid-July and mid-August.

237. Amelioration of Forest Sites

See also Nos. 4073, 4081, 4400, 4496, 4513–4, 4519.

4536. STEWART, G. G. **Preliminary results of experiments in drain deepening in two Border forests.** *Rep. For. Res. For. Comm., Lond. 1957/58*, 1959 (131–7). 1 ref.

The results of two experiments in deepening drains from 6 or 9 in. to 24 in. in Sitka Spruce forests on *Molinia* peat overlying clay are described. In one case there was scarcely any effect on the water table between the drains over 4 years, whereas in the other the water level was reduced by 5 in. In neither case was there any significant effect on the growth of the trees.

4537. HUIKARI, O. **Drainage of swamp [peat-bog] lands for forestry purposes in Finland.** *J. For.* 57 (2), 1959 (128–9).

A short review mentioning the 4-ton drainage plough manufactured by the Lokomo Co., Tampere, Finland and how it is used. The scope of drainage projects (accomplished and planned) in Finland is discussed.

4538. HEIKURAINEN, L. Tutkimus metsäojitusalueiden tilasta ja puustosta. **[Areas drained for forestry in Finland and their stands.]** *Acta for. fenn.* 69 (1), 1959. pp. 279. 89 refs. [Fi.g.*g*.]

Part I surveys the present condition of the areas drained between 1929 and 1939 as to their present utilization, the success of the drainage, the state of the ditches and the silvicultural condition of the stands, classified by bog types. On the basis of extensive ocular assessments, less than half of the forests are classed as satisfactory, and nearly a quarter as poor, and it is thought that extensive improvement fellings and regeneration measures will be needed if much of the effort put into drainage is not to be wasted. Part II presents data on species composition, volume and increment from many representative sample plots and analyses them by climatic zones, bog types, thickness of peat layer, distance between ditches etc. A new classification of bogs as to drainage-worthiness [cf. *F.A.* 14 No. 2995] based on volume production is presented. [Cf. *F.A.* 20 No. 3154.] *From author's summary.*

4539. PAARLAHTI, K. Metsäojituksen vaikutus eräiden suotyyppien pieneliöstöön. **[The effect of forest drainage on the micro-organisms in some swamp types.]** *Metsät. Aikak.* 1958 (12), (427–9). [Fi.e.]

The effect of drainage was found to be confined to a thin surface layer; it could not be seen 30–35 cm. down. It is concluded that the most satisfactory drainage system is a dense network of shallow ditches. *From author's summary.*

4540. Sonderheft: Düngung und chemische Unkrautbekämpfung im Walde. **[Special number: Fertilizing and chemical weed control in the forest.]** *Forst- u. Holzw.* 14 (8), 1959 (177–92). Many refs. [G.]

Contains the following: The influence of fertilizer application, especially N, on the flowering of forest trees (*H. Mayer-Krapoll*); The influence of air pollution and fertilizers, especially lime, on the soil in smoke-damage areas (*K. F. Wentzel*); Chemical and biological changes of raw humus due to lime and H_3PO_4 fertilizing (*B. Schneider*); The possibilities of using chemicals for weed control in nurseries and plantations (*P. Burschel*); Controlling shrubs in conifer plantations with synthetic growth regulators (*R. Immel* and *G. Linden*).

4541. MAYER-KRAPOLL, H. Die Düngung von Waldbeständen unter Einsatz von Flugzeugen. **[Using aircraft for fertilizing forest stands.]** *Forst- u. Holzw.* 14 (12), 1959 (258–60). 12 refs. [G.]

A general account of aerial application of N fertilizers on a [Pine] forest at Kleve, W. Germany, in March, 1959. The aircraft used was a Piper, able to carry 300 kg. of fertilizer. Ca. 50 ha./day were covered, at a rate of 300 kg./ha. (78 kg. pure N), the airstrip being very close to the forest. Costs vary according to airstrip distance, from DM.24 to DM.39/ha., excluding fertilizer costs, ground transport etc.

4542. SCHOEPFFER, H. 'Als Anhalt diene . . .' **[As a rough guide . . .]** *Forst- u. Holzw.* 14 (6), 1959 (134, 136–8). 5 refs. [G.]

Gives data from a stand enumeration, and from soil and leaf analyses on two similar adjacent plots, 51 years after (*a*) liming, cultivation and sowing of Beech, and (*b*) removal of raw humus in strips and sowing of Beech. Also gives stand data for two other plots: (*c*) as (*a*), and (*d*) as (*b*), but planted, not sown, with Beech. The fact that there is now no significant difference between plots (*a*) and (*b*), and that Beech on the unlimed plot (*d*) is better than that on (*c*) by about half a quality class, is discussed as an illustration of the dangers of facile generalizations on fertilizer treatments.

4543. MOOSMAYER, H.-U., and SCHAIRER, E. Meliorationsversuche mit verschiedenen Holzarten im Forstbezirk Hohenberg (Schwäbisch-Fränkisches Keuperbergland). **[Site amelioration trials with various species in Hohenberg district (Swabo-Franconian keuper highlands).]** *Mitt. Ver. forstl. Standortskunde ForstpflZücht.* No. 8, 1959 (52–62 + 6 photos). 15 refs. [G.g.]

The trials, established in 1926 with 14 species on (*a*) a coarse, wet, poor sand, (*b*) a heavy, periodically waterlogged clay, were marred by inadequate plot size and many other defects, but indicated that growth responses on (*a*) to a brushwood mulch plus lupins with basic slag and K salts, with or without liming, were good. Thus *Quercus robur* reached 1·5 m. in 5 years against 7–10 years where the mulch only was used. No significant responses were found on (*b*) except for Alder and Ash to lime. The growth of the various species on (*a*), independent of treatment, is compared.

4544. LOUB, W. Walddüngungsmassnahmen im Lichte der Bodenmikrobiologie. **[Forest fertilization and the microbiology of the soil]** *Allg. Forstzeitschr.* 14 (20), 1959 (369–71). 12 refs. [G.g.]

Results of biological investigation of fertilizer trials in Spruce stands in S. Württemburg on acid brown soils, and in Austria on semipodzols, are summarized as follows: Treatment with Ca in various forms reduced the number of species and the population of fungi secreting large amounts of organic acids or antibiotics and thus inhibiting litter decomposition. $NH_4NO_3{\cdot}CaCO_3$ in large doses caused the greatest increase in bacteria and fungi in the soil, particularly of cellulose-decomposing bacteria, and the greatest reduction in organic matter and N per ha. It is thought that this reduction has perhaps been too drastic, and fertilizing with Ca, P and N (also as $NH_4NO_3.CaCO_3$) is considered the most favourable from the microbiological point of view. [Cf. *F.A.* 19 Nos. 1719–20.]

4545. Boggess, W. R., and Gilmore, A. R. **Diameter growth response of Shortleaf Pine in Southern Illinois to nitrogen fertilization.** *For. Note Ill. agric. Exp. Sta.* No. 84, 1959. pp. 2.

Three treatments were given in March 1958 to $\frac{1}{20}$-acre plots in a 20-year *Pinus echinata* plantation viz. (*a*) 100 lb. NH_4NO_3, (*b*) ditto + 100 lb. P_2O_5, (*c*) control. Mean diameter increment at the end of the 1958 growing season was: (*a*) 0·158 in., (*b*) 0·123 in., and (*c*) 0·106 in. The difference between (*b*) and (*c*) was not significant, but the superiority of (*a*) was significant at the 1% level.

4546. **Forest fertilizer trials.** *Rep. Macaulay Inst. Soil Res. 1957/58*, [1959] (44).

[Cf. *F.A.* 19 No. 4176.] In the N/K/Mg trial laid down at Culbin Forest in April 1956, the N treatments produced a considerable increase in height growth by the end of the second growing season. Increased uptake of N and K in plots receiving these fertilizers was still appreciable, but not so great as in the previous year. Foliage P content was increased by the N treatment, in contrast to the results obtained in the first year, when N applications caused an apparent reduction in P content due to the 'diluting' effect of increased needle dry weight. The Mg treatment again had no effect on either Mg uptake or height growth. It would appear that trees growing on the dunes would benefit from added N, but that the usual commercial N fertilizers are leached from the sand too rapidly to make their application economically attractive. The N/K/Mg factorial experiment laid down in April 1957 in *Pinus contorta* at the Lon Mor (on deep peat) revealed a significant reduction in height growth in all fertilized plots by the end of the first growing season, probably due to a check to spring growth by high salt concentrations in the soil solution.

4547. Edwards, M. V. **Use of triple superphosphate for forest manuring.** *Rep. For. Res. For. Comm., Lond. 1957/58*, 1959 (117–30). 2 refs.

Experiments (full data tabulated) indicate that the difference between the effects of (*a*) ground mineral phosphate applied in checked plantations at 1·5 oz./tree and (*b*) triple superphosphate at 0·5 oz. is not significant. The 0·5 oz. (*b*) proved equally beneficial to all the species tested, and no damage is to be expected from applications made in the normal way. Applications of (*a*) may continue under normal practice, but wherever the saving in bulk by using (*b*) is likely to be of value, this fertilizer may be used at $\frac{1}{3}$ of the rate used for (*a*).

4548. Wood, R. F., and Holmes, G. D. **Silvicultural investigations in the forest: (A) South and Central England and Wales. Improvement of checked plantations.** *Rep. For. Res. For. Comm., Lond. 1957/58*, 1959 (40–1).

Investigations are in progress to determine methods of improving the growth of checked or unsatisfactory Spruce and Pine crops on infertile sites dominated by heather and gorse vegetation. Striking responses have been made to phosphate manuring on a number of checked plantations (e.g. 3 years after application of 6 cwt. potassic superphosphate/acre, 20-year Sitka Spruce is 5–6 ft. high vs. controls still in check at 1½–2 ft.). Large-scale mechanical broadcasting of triple superphosphate at rates up to 6 cwt./acre has been carried out, to evaluate the practicability and economics of such treatment. Elimination of dense heather by spraying with 2,4-D had relatively little effect on crop growth in the first season after treatment, but the effects of added phosphate were greater in such cleared areas.

4549. Leyton, L., and Weatherell, J. **Coniferous litter amendments and the growth of Sitka Spruce.** *Forestry* 32 (1), 1959 (7–13). 11 refs.

The growth of semi-checked Sitka Spruce on heathland has been stimulated to different degrees by the annual application (1956 and 1957) of litter of Scots Pine, Corsican Pine, Lodgepole Pine, Japanese Larch and Sitka Spruce, at rates corresponding to normal plantation conditions, following a heavier initial application (1955). Foliar analysis suggests that the response is at least partially attributable to the influence of the litters on the N nutrition of the Spruce, and differences in effect between litters appear to be largely determined by their total N contents. In this respect Japanese Larch with an annual needle-fall generally greater than that of the Pines and a higher N content, offers the best promise as a nurse species. Experience has already shown that once established this species is capable of growing quite vigorously in the presence of heather, and in row mixtures with Spruce has very successfully brought the Spruce into canopy [cf. *F.A.* 19 No. 1713].

4550. Wittich, W. Untersuchungen über die Eignung von Stadtmüll als forstliches Düngemittel. **[The use of town refuse as fertilizer in forestry.]** *Forschungsergebnisse zur Förderung der forstlichen Erzeugung, Bundesministerium für ELF(AID), Hiltrup (Landwirtschaftsverlag)* No. 2, 1958 (39–42, 90, 94, 96). [G.g.e.f.]

Summarizes pot experiments with sifted refuse from a Düsseldorf dump, untreated or enriched with gaseous NH_3 and/or purified sewage, tabulating the forms in which N was present in the ash-free organic substance. In tests with Spruce seedlings on a poor sandy soil, growth response in dry-matter production was better with lower dosages. N, P and Ca uptake was increased considerably over controls in the first year, less so in the second. [Cf. *F.A.* 18 No. 4053; 19 No. 2995.]

4551. Little, S., Lull, H. W., and Renson, I. **Changes in woodland vegetation and soils after spraying large amounts of waste water.** *For. Sci.* 5 (1), 1959 (18–27). 6 refs.

A more detailed account of experiments previously reported [cf. *F.A.* 19 No. 4182], with photographs, tabulated growth data etc.

238. Timber Plantation Crops requiring Special Treatment

4552. KOHÁN, Š. Príspevok k otázke pestovania topol'ov na východoslovenskej nížine. **[Growing Poplars in the E. Slovakian plain.]** *Lesn. Čas.* 5 (2), 1959 (105–42). 13 refs. [Slovak.russ.g.]

Describes the possibilities for Poplar growing in the Královský Chlmec district. Climatically the area is well suited, but on the heavy loam soil and alluvium (low in minerals and without $CaCO_3$), intensive soil preparation and cultivation are required. Stands planted before 1948 are generally too dense and poorly tended, but one 20-year stand of *Populus* × *robusta* averages 24·5 m. in height and 40·3 cm. d.b.h. Stands planted since 1948 on small clear-felled areas at 4 × 4 m. spacing are doing well.

24. Tending of Stands and Trees

241. Cleaning

4553. TUOVINEN, A. Raivausmoottorisahan työtulokset ja -kustannukset. **[Performance and operating costs of brush motor saws.]** *Tied., Metsäteho, Helsinki* No. 157, 1959. pp. 21. 4 refs. [Fi.e.*e.*]

Presents the results of studies of cleaning with the Jo-Bu saw in young growth, sapling and pole forests [of Spruce, Pine, Birch and Alder] in S. Finland, showing (1) the increase in working time with increasing number of stems, from 100 to 900, per 100 sq. m.; (2) the extra time needed (ca. 40%) in Spruce areas when the majority of Spruce exceed 1 m. high; (3) the time, ca. 30–70 min., needed to fell one solid cu.m. of stem wood, when at least 5% of the trees have a minimum cross-cutting diam. of 5 cm.; (4) operating costs; and (5) wages. The basal areas of the trees removed and the solid cubic volume of stem wood proved unsatisfactory together, and in conjunction with a size classification, as a basis for classifying work difficulty. *From author's summary.*

4554. BOYD, R. J. **Cleaning to favour Western White Pine—its effects upon composition, growth and potential values.** *J. For.* 57 (5), 1959 (333–6). 5 refs.

In 1935, three 0·4-acre plots were established in an 8-year post-fire stand of *Pinus monticola* and other conifers in Idaho: (*a*) all trees > 6 in. tall except *P. monticola* and Redcedar [*Juniperus* sp?] were felled; (*b*) all *P. monticola* and Redcedar were left, Larch within 8 ft. of, and Spruce and Douglas Fir crowding *P. monticola* being felled; (*c*) control. Also in 1935, at another site, a 16-year stand of *P. monticola*, Fir and Hemlock was cleaned to favour the Pine. Both sites show, after 20 years, that the improvement in composition has been maintained, that the size and volume of potential crop trees were improved by the reduction in stand density, and that similar cleaning operations under current economic conditions should prove financially worth while.

242. Thinning

See also Nos. 4295, 4353, 4575, 4993, 5003–4, 5024, 5068–72, 5321.

4555. VYSKOT, M. Srovnání pozitivního a negativního výběru v technice pěstěni lesů. **[Comparison of positive and negative thinning in silviculture.]** *Sborn. čsl. Akad. zeměd.* (*Lesn.*) 4 (6), 1958 (429–70 + 1 map). 24 refs. [Cz.cz.russ.g.]

Comparisons of positive and negative thinning (p.t. and n.t.) as propounded by Schädelin and Krutzsch were made on plots of Spruce, Pine, Beech, and Oak (thickets, poles, and mature trees) laid out in 1948. Stand inventory data for 1950 and 1957 are tabulated and graphed. Results indicate that p.t. removes a greater % of standing volume than n.t.; n.t. resembles thinning from below, and p.t. thinning from above; in the majority of cases p.t. caused greater incremental response.

4556. VYSKOT, M. Poznatky z fragmentů probírkových pokusů, založených na území ČSR v letech 1885–1892. **[Findings from the fragments of experimental thinning plots, laid out in Czechoslovakia in 1885–92.]** *Sborn. čsl. Akad. zeměd.* (*Lesn.*) 5 (1), 1959 (1–28 + 13 tbls.). 35 refs. [Cz.cz.russ.g.]

Discusses findings from 12 plots thinned from below (10 Spruce, 1 Beech, 1 Silver Fir) [cf. *F.A.* 17 No. 1565], in which the influence of (*a*) stand age at the start of thinning, (*b*) the severity and (*c*) the frequency of thinnings, had been investigated. General conclusions were that early, moderate thinning (started at 21–25 years) had a favourable influence on the growth and total production of the stand; heavier thinnings in most cases resulted in larger volume and value yields; no clear superiority could be observed among thinning intervals of from 3 to 14 years. Stand data are tabulated but the limited nature of the experimental material available is stressed.

4557. LOYCKE, H. J. Zur Frage der Lebenderhaltung der Unterschicht in Rotbuchen-Jungbeständen. **[The problem of keeping alive the lower layer of young *Fagus sylvatica* stands.]** *Forst- u. Holzw.* 14 (11), 1959 (237–43). 8 refs. [G.]

Adjacent plots, each of 225 sq.m., were established in 1954 in an undisturbed naturally regenerated 18-year Beech stand growing under near-optimum conditions. On plot II, 14·5% of the upper and ca. ⅓ of the middle tree layer were removed in thinning; on plot III 22·2% and ca. ½ respectively; and on plot IV 10·7% and all the middle layer. The treatment on plot II kept the lower layer healthy for at least three years, and appeared to be the correct treatment for such stands. Removal of ⩾ 50% of the middle layer caused a sudden shock to the trees of the lower layer, killing 15–20% of them. In 1957, 90·4% of the lower layer was still alive on plot II; 82% on III; and 86·5% on IV. The future management of these stands is discussed, and time-study data on the thinning operation are also presented.

4558. COSTANTINO, I. N. Primeros resultados de las parcelas experimentales permanentes de *Libocedrus chilensis* (Don) Endl. **[First results from the permanent sample plots of *Libocedrus chilensis*.]** *Repr.* from *Revista de la Facultad de Agronomía, La Plata* 34, 1958 (131–59). [Span.span.e.]

Presents the results of measurements made on sample plots established ten years previously [cf.

F.A. 13 No. 303]. In the unthinned control plot c.a.i. was negligible, whereas in the 3 plots initially thinned to different grades, the c.a.i. was as follows: Plot A—16 cu.m./ha., Plot B—8 cu.m./ha., and Plot C—6 cu.m./ha.

4559. EDWARDS, M. V. **Abnormally heavy thinnings in young Larch**. *Forestry* 32 (1), 1959 (23–30). 7 refs.

A short assessment of an experiment with European Larch in 4 forests in Scotland. Starting in 1944 at a mean height of ca. 10 ft., the crops were thinned in successive alternate years to stockings of 800, 600, 400, and 200 trees/acre, on the lines of South African work [cf. *F.A.* 19 No. 422]. A control was thinned to D grade. This preliminary assessment indicates that, with the comparatively slow rate of growth in Scotland, the optimum intensity of thinning is that which gives the maximum growing space commensurate with the control of competing vegetation, and that the arbitrary reductions in stocking in this experiment mostly exceeded this optimum. Disease and dieback occurred in 3 of the experimental areas. The heavy thinnings reduced the number of cankered, dead, and dying trees, but did not cure the trouble on the more resistant remainder. Even under the heaviest thinning grade, some trees became cankered or died. *From author's summary.*

4560. **[Thinning Shortleaf Pine.]** *Rep. Cent. St. For. Exp. Sta. 1958*, 1959 (43).

[Cf. *F.A.* 18 No. 421.] A second thinning was made in a 21-year Shortleaf Pine plantation in S. Indiana. Volume growth in the 7-year period was greatest in the control plots, least in the most heavily thinned plots (to 80 sq. ft. b.a.), and total cu. ft. volume more than doubled on all plots. Results indicate that thinning may be left until stands are ≮ 20 years old, when thinnings will also be more valuable.

4561. BOGGESS, W. R. **Foliar nitrogen content of Shortleaf Pine as influenced by thinning**. *For. Note Ill. agric. Exp. Sta.* No. 80, 1959. pp. 2. 8 refs.

N content in leaves from 17- to 20-year trees was significantly higher on 12 thinned plots than on unthinned controls. The difference was greater on good than on poor sites. It is attributed to more rapid breakdown of litter, less competition for available N, and increase in decaying debris due to cutting. The thinnings had removed > ⅓ of the growing stock.

4562. BALDWIN, H. I. **Thinning Red Pine at different spacings**. *Fox For. Note* No. 71, 1959. pp. 2. 1 ref.

[Cf. *F.A.* 10 No. 2566; 20 No. 4517.] Three moderately heavy low thinnings revealed no significant effects after 23 years. Total b.a. and number of trees > 8 in. in diam. were no greater than on corresponding unthinned controls, and mean d.b.h. only ca. 1 in. more.

4563. **[Thinning overstocked White Pine.]** *Rep. Cent. St. For. Exp. Sta. 1958*, 1959 (43–4).

In a heavily over-stocked 51-year plantation in the Amana Experimental Forest, thinned to different intensities in 1949, growth in the next 9 years continued to decline, though less in the lightly and moderately thinned plots, indicating that after prolonged overcrowding former vigour is recovered very slowly, if at all.

4564. MOSHER, M. M. **Thinning in sixty-year-old Douglas Fir (mountain form)**. *Sta. Circ. Wash. St. agric. Exp. Sta.* No. 342, 1958. pp. 3.

In small plots of poor site quality (mean b.a. 143 sq. ft./acre, mean height 56 ft.) in which thinnings removed ca. 18% of the b.a., evaluation after 5 years showed ca. 20% improvement in d.b.h. growth over controls, at the expense of reduced b.a. increment and greater b.a. mortality (absolutely and as a %). The operation is not advised on stands of similar age and quality unless the thinnings (here 7 cords/acre) can be sold.

4565. COLCLOUGH, D. M. **Thinning transition hardwoods**. *Fox For. Note* No. 73, 1959. pp. 2.

Presents data from two small plots of 18-year-old Northern and Middle Atlantic hardwoods. Removing just under 50% of the growing stock took 60 hours/acre and yielded 6 cords. Volumes after 10 years had increased by about the same amount on the thinned and the unthinned plot, relative increment %s being 12·4 and 9·0. The main difference was in quality and in the proportion of large trees.

4566. **Eastern Cottonwood responds to thinning.** *Rep. Cent. St. For. Exp. Sta. 1958*, 1959 (42–3).

An 8-year-old stand of *Populus deltoides* thinned from 85 sq. ft. b.a. to 50 sq. ft., put on 2·4 in. diam. increment in 5 years (185 trees/acre), vs. 1·7 in. for controls (268/acre). Volume increment in cu. ft. was the same in both.

4567. SKILLING, D. D. **Growth of swamp conifers following an improvement cut**. *Sta. Pap. Lake St. For. Exp. Sta.* No. 71, 1959. pp. 10. 5 refs.

In the 10 years after improvement cuts of different intensities on 20 plots in a (mainly) 65-year stand in N.E. Wisconsin, b.a. growth was good on all plots but the relatively smaller growth on the low-density (ca. 90 sq. ft./acre) plots was on fewer, better formed trees. Diam. growth of the 3 main species *Thuja occidentalis*, *Abies balsamea* and *Picea mariana* was good at all densities and best in the larger diam. classes of lightly stocked plots. In 1957 regeneration was abundant but mostly < 3 ft. high, indicating that the 1947 cuts were not heavy enough to ensure the establishment of advance growth before a second cut. *T. occidentalis* had in places been severely browsed by hares (*Lepus americanus*).

243. Opening of the Canopy (Increment Fellings, Overhead Release and Improvement Fellings)

See also Nos. 4387, 4740 *et seq.*, 4930–1, 5010.

4568. **Managing small woodlands.** *Rep. Cent. St. For. Exp. Sta. 1958*, 1959 (45–7).

In a 24-acre farm woodland experiment (Kaskaskia Experimental Forest) aiming at attaining sustained yields by selection and improvement fellings on a 3-year cycle, a total of 42,000 bd. ft. was removed in 2 years. Current volume nearly equals that of the original stand, and is on much better stems. The treatment, however, has led to an unbalanced diameter distribution, so that further fellings must be postponed for 4–7 years, and to an undesirable species composition of the regeneration, only 23% of the seedlings and 6% of the saplings being of valuable species (i.e. Oak, Tulip Tree, Black Walnut). On adjacent areas, with similar stand and site conditions, the group selection system gave better species composition of the regeneration.

4569. Roonwal, M. L., Chatterjee, P. N., and Thapa, R. S. **Results of experiments on basal girdling in four species of timbers in Bihar in relation to anti-insect protection.** *Indian For. Leafl.* No. 154, 1956 (1957). pp. 26. 1 ref.

A study was made with (*a*) *Anogeissus latifolia*, (*b*) *Pterocarpus marsupium*, (*c*) *Schleichera oleosa*, and (*d*) *Terminalia tomentosa*. Five trees of each species were girdled at quarterly intervals during 1948–49, and all were felled in 1950–51, converted into planks, and observed until April 1953. Except for (*c*) which were markedly resistant, the girdled trees all died of the girdling. Girdling gave no protection against insect attack either in the tree or in the converted timber, the severity of which decreased in the order (*b*), (*a*), (*d*), (*c*). Ungirdled standing controls (5 of each species) remained unattacked. A list of the insects attacking each species is given.

4570. **CMU to control hardwoods.** *Rep. Cent. St. For. Exp. Sta. 1958*, 1959 (39).

In the Missouri Ozarks all overstorey hardwoods were killed by sprinkling active CMU [monuron] at 5–8lb/acre in a 6-in. circle round the tree, and the area was then planted with Shortleaf Pine. After 3 years 68% of the surviving Pines averaged 3 ft. in height. Extreme care must be taken in using CMU as it is especially toxic to Pines, washes easily down slopes and may sterilize soils for 3–5 years.

4571. Stransky, J. J. **Concentrated or diluted 2,4,5-T as a supplement to girdling?** *J. For.* 57 (6), 1959 (432–4). 6 refs.

Sample trees from two d.b.h. classes (3·5–5·5, 5·6–7·5 in.) of *Quercus stellata* and *Liquidambar styraciflua*, adjudged free from root grafts, were girdled by axe (*a*), or by girdling machine (*b*), and 2,4,5-T was applied by (1) spraying as a concentrate, or (2) painting on as a 1/50 diesel oil solution. Tree size and species did not affect results significantly. Only without chemical treatment was (*a*) more effective than (*b*); with 2,4,5-T, (*a*) and (*b*) gave similar results. All treatments involving 2,4,5-T gave significantly higher crown kill than girdling alone. Both (1) and (2) killed crowns equally well, but (2) was by far the better sprout inhibitor.

4572. **Killing unwanted trees.** *Rep. Cent. St. For. Exp. Sta. 1958*, 1959 (38–9).

Applying 2,4,5-T to axe-frills was the most effective but also the most expensive method of eliminating culls on an upland hardwood area, though the cost per killed tree (with 90% mortality) was much less than for the other 3 methods (not specified). To treat a number of trees totalling 100 sq. ft. in b.a., 10·8 man-hours of labour and 13·4 gal. of solution were needed. In controlling the hardwood understorey of Pine stands with 2,4,5-T in the Missouri Ozarks the cost of ca. $15/acre is estimated to be recovered in 4–5 years by the gain in Pine volume growth.

4573. Burns, P. Y., Box, B. H., and Nation, H. A. **Comparison of herbicides in aerial spraying for Pine release in Northwestern Louisiana.** *LSU For. Notes La. agric. Exp. Sta.* No. 29, 1959. pp. 2.

Of the herbicides tested (Esteron 245, Dow 245-T Amine, and Kuron—all preparations of 2,4,5-T) the most effective was Esteron 245 applied in oil/water emulsion at 2 lb. acid equivalent in 5 gal./acre. This killed most of the overstorey hardwoods that commonly overtop Pines in upland stands in the South.

4574. Burns, P. Y. **Recommendations for aerial spraying of hardwoods to release Pines.** *LSU For. Notes La. agric. Exp. Sta.* No. 28, 1959. pp. 2.

Detailed recommendations for spraying with low-volatile esters of 2,4,5-T.

4575. **Thinning by poison.** *Rep. For. Res. Inst. N.Z. For. Serv. 1957/58*, 1958 (16).

Experiments with 2,4,5-T as a substitute for As as a tree poison gave no significant results. Remeasurements in plots started in 1954 indicate that there is less taper of butt logs in axe-thinned than in poison-thinned stands. [Cf. *F.A.* 16 No. 1742.]

4576. Truman, R. **Tree poisoning with 2,4-D and 2,4,5-T.** *Bull. For. Comm. N.S.W.* No. 2, 1958. pp. 28. 7 refs.

Part 1 describes experiments [results tabulated] to determine the reaction of *Eucalyptus maculata* to a series of herbicides at different seasons of the year; Part 2 makes recommendations for the control of various woody species using 2,4-D and 2,4,5-T formulations, including methods of application and registered herbicides obtainable in New South Wales.

4577. **Arboricides.** *Rep. For. Dep. Ghana 1955/56*, 1958 (50–1).

Experiments with various formulations and mixtures of 2,4-D and 2,4,5-T in water and in diesel oil, applied as bark sprays, gave poor results (the best was 17% kill after 22 weeks) compared with 45% after 11 weeks for Na arsenite (usually increasing to 90%). The costs of the 'hormone' treatments are also very much greater—5s./acre for diesel oil alone against 8d./acre for Na arsenite.

4578. **[Poison-girdling of unwanted trees with 2,4,5-T.]** *Rapp. Inst. nat. Étude agron. Congo belge 1957*, 1959 (265–6). [F.]

Extensive experiments in connexion with operations to open the canopy ('*uniformisation par le haut*') permit a classification of forest species as: (*a*) very susceptible (mortality ≥ 75%)—*Ricinodendron heudelotii*, *Albizzia* sp., *Pycnanthus angolensis*, *Albizzia ferruginea*, *Pentaclethra macrophylla*, *P. eetveldiana*, *Aidia ochroleuca*, *Pseudospondias gigantea*, *Dacryodes pubescens*, *Spondias mombin*, *Trichilia heudelotii*, *Discoglypremna caloneura*, *Piptadeniastrum africanum*, *Newtonia leucocarpa*, *Ceiba thonningii*, *Bombax* *flammeum* and *Sterculia bequaertii*; (*b*) moderately susceptible (mortality 50%)—*Antrocaryon micraster* and *Pteleopsis hylodendron*; (*c*) resistant (mortality < 30%)—*Celtis adolfi-frederici*, *C. mildbraedii*, *C. zenkeri*, *Hexalobus crispiflorus*, *Symphonia globulifera*, *Hannoa klaineana*, *Holoptelea grandis*, *Pterocarpus tinctorius*, *Klainedoxa gabonensis*, *Ongokea gore*, *Alstonia congensis* and *Monodora myristica*.

245. Tending of Trees, Pruning etc.

See also Nos. 4294, 5042.

4579. PIRONE, P. P. **Tree maintenance.** Oxford University Press, New York. 1959. pp. xviii + 483. 406 refs.

A 3rd, revised, edition of *Maintenance of shade and ornamental trees* [cf. Pirone, *F.A.* 3 p. 215]. Part I, General maintenance practices, includes a chapter on trees suitable for various locations, emphasizing low-growing species, and Part II, Specific abnormalities of trees, a chapter on pests and diseases of 62 species or genera. The selective bibliography is classified by subject.

4580. MAYER-WEGELIN, H. Die neuere Entwicklung der Technik des Aufästens. **[Recent developments in pruning techniques.]** *Allg. Forstzeitschr.* 14 (22), 1959 (397–400). 56 refs. [G.]

A review based on world literature, including the effect of pruning on increment, injuries through pruning, pruning heights, implements, bud pruning, and 'chemical pruning'.

4581. RODGER, G. J. **Pruning Radiata Pine.** *Rep. For. Timb. Bur. Aust. 1957*, 1958 (21).

A selective pruning experiment initiated in 1944 in a 7-year-old stand planted at 12 × 12 ft. was concluded. A comparison was made between the increment of a plot (*a*) with all trees, (*b*) with some trees, pruned periodically to half-height. Increment differences between treatments, in favour of (*a*), were significant for the period 1944–48, appreciable but not significant for 1948–50, and inappreciable for 1950–57. The indications are that after the base of the green crown of the remainder of the stand has attained the height of the pruning, the selectively pruned trees are able to maintain their position in the stand.

4582. SKILLING, D. D. **Response of Yellow Birch to artificial pruning.** *J. For.* 57 (6), 1959 (429–32).

In a 20-year stand (Yellow Birch 4%), 25 dominants and co-dominants were pruned by saws in 1947 and 10 used as controls. Examination after 10 years showed that pruning to half the total height had not adversely affected diameter or height increment. Pruning increased clear bole length, the effect still being present 10 years later. The rate of wound healing was related closely to wound size and tree growth rate, small wounds on rapidly growing trees healing quickest. Few epicormics developed after pruning and all were dead within 3 years of it. Timber defects were found in many naturally pruned trees whereas with careful artificial pruning none developed. Where large branches were not pruned flush with the bark, ingrown bark developed during healing. There was no evidence that artificial pruning encouraged decay.

4583. JOHNSON, R. L. **Pruning Cottonwood.** *Sth. Lumberm.* 198 (2473), 1959 (28–9).

In a 14-year stand spaced 8 × 8 ft. in Mississippi, 13 trees averaging ca. 9 in. in d.b.h. and 50 ft. in height, were pruned to 17·4 ft. Wounds, mostly from live branches < 2½ in. in diam., nearly all healed within 2 years. Rot and infection, and growth of epicormics, were slight. Growth was not affected in this stand, but in other, younger, stands it was reduced by pruning, suggesting that not more than half the living crown should be removed.

4584. CÍSAŘ, V. Vyhodnocení pokusu s pěstováním bezsukého borového dřeva. **[Evaluation of experiments in growing knotless Pine timber.]** *Sborn. čsl. Akad. zeměd.* (*Lesn.*) 4 (7), 1958 (585–92). 5 refs. [Cz.cz.russ.g.]

In a bud-pruning experiment already described [see *F.A.* 16 No. 1746] results up to autumn 1957 (i.e. 6 years after the start) were not as promising as they seemed in 1954. Reduction in height increment, damage to the terminal bud, Lammas-shoot formation, and forking were all observed. It is considered that dry pruning in closed stands offers better prospects, but that in open Pine stands with gaps, and in 'nest' plantings, Krotkevič's method may have advantages.

25. Treatment of Defective, Derelict or Very Open Stands

See also Nos. 4367–8, 4418.

4585. BUXTON, S. F. **Fargo plantation.** *Quart. J. For.* 53 (2), 1959 (139–43).

Describes how a devastated plantation on Salisbury Plain, neglected for ca. 30 years, was restored to health and productivity despite rabbits, troops on manoeuvres, hunts etc., by planting up with Beech, Japanese and European Larch, and Corsican Pine.

4586. SCHAEFFER, R., and MOREAU, R. Étude forestière, pédologique et microbiologique d'un bois très dégradé de la Haute-Saône. **[A silvicultural, pedological and microbiological study of a very degraded woodland in the Haute-Saône.]** *Rev. for. franç.* 11 (6), 1959 (417–33). 5 refs. [F.]

The wood consists of mixed hardwoods (Oak, Beech, Hornbeam and Birch) with some introduced Robinia and Scots Pine; soil flora is scanty and relatively inactive, tree growth poor, and frost crack very common. Conversion to conifers is recommended.

26. Combinations of Forestry with Agriculture and Pastoral Husbandry. Irrigated and Floodland Forests, Shelterbelts etc., and their Treatment

261. Alternate Forestry and Agriculture, Periodic or Temporary Agricultural Use of Forest Land

4587. NYE, P. H. **The relative importance of fallows and soils in storing plant nutrients in Ghana.**

J. W. Afr. Sci. Ass. 4 (1), 1958 (31–49). 8 refs. H.S.B.

Samples of the grasses, herbs and woody vegetation on measured plots were separated, where appropriate, into leaves, stems, roots (to 12 in. depth) and litter, and weighed and analysed for % composition and amounts per acre of N, P, K, Ca and Mg as representing the stored nutrients of the fallows. The composition of the top 12 in. of the soil under these fallows and the amounts per acre of nutrients stored therein are also tabulated. The fallows studied were (*a*) savanna types: *Imperata cylindrica*, *Andropogon gayanus*, woodland, and pigeon pea; (*b*) high-forest-zone types: 20-year secondary forest (two), planted grass (three) and leguminous fallows (two); (*c*) coastal scrub and grass-zone types: 4-year and 10-year coastal thickets, *Panicum maximum* (1, 2 and 3 years old), pigeon pea, and natural grassland. The N in these fallows is lost at burning. In (*a*), the full storage capacity of the grasses is reached in 2–3 years, all further storage being attained by the growth of woody plants. Wooded savanna carrying ca. 3–16 cords/acre stored very much more K, Ca and Mg and as much P as grasses. Exchangeable Ca and Mg in the soil greatly exceeded those of fallows, but exchangeable K of soil and of woodland trees and grasses was low, the latter being therefore important husbanders of K. The P contained on the fallow raises the soil P potential on clearing to an equivalent of $\nless$ 1 cwt. superphosphate/acre, largely correcting the first and second year's cropping deficiency. In (*b*) the secondary high forest stores more of all the nutrients than savanna woodland. *Pennisetum purpureum* greatly excelled any other planted fallow and was especially noted for K storage. In (*c*), grass and thicket for the first 3 years were equal in storage. The 10-year thicket stored about twice as much as the 4-year one. Over the forest zone the role of the vegetation is most important in protecting K, mobilizing P, and increasing organic matter and N.

4588. NYE, P. H. **Plant nutrients in some indigenous systems of agriculture**. In *Report of a conference of directors and senior officers of overseas departments of agriculture and agricultural institutions held at Wye College, Kent, Sept. 1958*. Colonial Office, London. 1958. pp. 43–7.

Outlines some findings on the nutrient cycle in forest and savanna soils under shifting cultivation in Ghana. In secondary rain forest (18 years old) the content of K, Ca, and Mg in the vegetation exceeded that in the top foot of soil, owing to excessive leaching. In savanna, the vegetation is poorer, and the soil somewhat richer in these. Values for these nutrients, and also N content, were highest in semi-deciduous forest. The speed of build-up of nutrients and organic matter and the equilibrium level of organic matter are greater in the forest. Reduction of humus in the cropping period is only about 4% a year, and no N deficiencies have appeared in maize and cassava in a 9-year trial after forest clearing, but P deficiencies appeared after 2 years and K deficiencies after 4, owing to leaching. In savanna cultivation, N supply was poorer but that of other nutrients better. The traditional system is thought to be well adapted to the forest, conserving the soil and, unless the cropping period is too prolonged, allowing speedy regeneration of woody growth, but to be ruinous for savanna soils.

263. Irrigated Forests. Forests subjected to Flooding or Seepage (*Auewald*)

See Nos. 4075, 5012.

264. Farm Forests

See Nos. 4568, 5436, 5449–50.

265. Strips or Lines at Road, Rail and Canal Sides etc.; Hedgerow Trees

See No. 4110.

266. Shelterbelts, Windbreaks

See also Nos. 4514, 4527, 4535, 4835.

4589. KAUL, R. N. **Shelter-belts to stop creep of the desert**. *Sci. & Cult.* 24 (9), 1959 (406–9). 9 refs. E.M.B.

Includes, separately for inland and coastal sand-drift areas, comprehensive lists of grass, shrub, and tree species from which to choose for local conditions in India. Composition and form of belt for Jodhpur conditions are now under trial.

4590. JONÁŠ, F. Příspěvek k otázce průběhu vlhkosti ve větrolamu v Obříství u Mělníka v roce 1954. [**The water régime in the Obříství shelterbelt near Mělník in 1954**.] *Sborn. čsl. Akad. zeměd.* (*Lesn.*) 4 (7), 1958 (569–84). 36 refs. [Cz.cz.russ.g.]

Compares the soil moisture changes on bare ground with those of plots in a shelterbelt [tree species not stated] sown with (*a*) lupins inoculated with nodule-forming (N-fixing) bacteria, and (*b*) non-inoculated lupins.

4591. PARAMONOV, A. JA. Effektivnost′ polezaščitnyh lesnyh polos v SSSR. [**The efficiency of shelterbelts in the U.S.S.R.**] *Repr.* from *Vestnik Instituta po Izučeniju SSSR* No. 2 (23), 1957 (1–23). 66 refs. [Russ.]

Examines the difficulties of growing shelterbelts in the steppe region and the influence of shelterbelts on the climate of the surrounding area and on crop yields. Many of the conclusions reached by Soviet investigators on the efficiency of shelterbelts are critically examined, and contradictions, misconceptions and cases of faulty evaluation of results are pointed out. The principle targets for criticism are the conclusions on the distance protected by the belt (according to Soviet research $>$ 20 times the height of the belt) and the advantages of permeable over impermeable belts. Some large-scale failures of tree growth in shelterbelts are also noted.

4592. GRUZDEV, D. M. Vlijanie lesnyh polos na vetrovuju ėroziju počv v Zavolž′e. [**The influence of shelterbelts on wind erosion in the Transvolga region.**] *Počvoved.* 1957 (9), (116–9). [Russ.e.] A.P.B.

During the winters of 1948–50 measurements were made of the amount and size distribution of soil particles suspended in the snow on either side of 45-year-old shelterbelts (4–6 rows of *Quercus robur* and

Acer tataricum) with (*a*) good and (*b*) poor permeability to wind, and on an unforested control area, in a ravine in Kuibyshev province. The shelterbelts reduced the amount of wind-eroded particles deposited at the bottom of the ravine to (*a*) $\frac{2}{7}$ and (*b*) $\frac{1}{7}$ of the value for the unforested area. The size of the eroded particles decreased with increasing distance from the shelterbelt.

4593. Elineckij, L. M. Ubeditel′nye dannye o vlijanii lesnyh polos na urožaj. **[Convincing data on the influence of shelterbelts on agricultural yields.]** *Lesn. Hoz.* 11 (5). 1958 (33–4). [Russ.]

Briefly reports part of a large-scale (256 observations) investigation in various parts of the U.S.S.R. on the effect of shelterbelts on crop yields, mainly of cereals in 1956—a favourable year for crops. Shelterbelts significantly increased yields, and permeable belts appeared to be the best for forest-steppe, steppe, and dry steppe zones.

268. Pastured Forests. Grazing on Forest and Open Ranges. Forage Plants etc.

See also Nos. 4051–2, 4262, 4528, 4734, 4736 *et seq.*, 5424.

4594. Plummer, A. P. **Restoration of Juniper-Pinyon ranges in Utah.** *Proc. Soc. Amer. For.* 1958 (1959), (207–11). 10 refs.

Describes methods of controlling the pigmy forest of (chiefly) *Juniperus osteosperma* and *Pinus edulis* or *P. monophylla*, which is encroaching on overgrazed ranges and which, even in fairly closed stands, contains large barren patches subject to erosion.

4595. Pase, C. P. **Herbage production and composition under immature Ponderosa Pine stands in the Black Hills.** *Repr.* from *Journal of Range Management, Portland* 11 (5), 1958 (238–42). 5 refs.

A survey made in 1956 produced a logarithmic relationship between total herbage production and Pine crown canopy, stand b.a. and Pine litter. Total herbage production ranged from 40 lb./acre (air-dry) under a 70% crown canopy to 2160 lb./acre on clear-felled areas. Grass, forb and shrub production on clear-felled areas was 1730, 305 and 125 lb./acre (air-dry) respectively compared with only 25, 5, and 10 lb./acre under dense unthinned stands. Under thinned stands with a crown canopy of 40%, grass, forb and shrub production was 170, 25 and 30 lb./acre (air-dry), respectively. Data are presented on the influence of crown canopy on species composition. *From author's summary.*

27. Arboreta. Arboriculture for Ornamental Purposes. Hedges and Hedge Plants.

See No. 4579.

28. Husbandry of Forest Products Other than Wood

281. Christmas Trees

See Nos. 4407, 4742.

282. Bark Crops

See No. 5040.

283. Fruit and Seed Crops etc.

See also Nos. 4235, 4240–1, 4732.

4596. **Vanilla plots.** *Rep. Dep. Agric. Seychelles 1957*, [1958] (12).

Information is being collected from observation plots of Vanilla in reforested areas. Young *Calophyllum inophyllum, Casuarina equisetifolia* and *Pterocarpus indicus* plantations appear to be best suited to the crop. It is essential to have the base of the Vanilla well mulched, and a good deal of work is necessary in pruning and thinning. The success or failure of the crop in young forest therefore depends, as much as anything, on the skill with which this shade-control is carried out. Where young forest trees do not happen to have a suitable branch over which the 'porteur' can be bent (an essential sap-restricting procedure to induce flowering) it has been found that a small peg of the rot- and termite-resistant wood 'Capuchin', driven lightly into a small bore-hole in the trunk, makes a harmless substitute.

284. Crops Tapped for Exudations etc.

See also No. 5101.

4597. Koev, D. V., and Kaludin, K. S. Văzmožnosti za dobivane na smola ot smărč i vlijanie na smolodobivaneto vărhu techničeskite svojstva na smarčovata dărvesina. **[Possibilities of tapping Spruce and the influence of tapping on the technical properties of its wood.]** *Izv. Inst. Gorata bălg. Akad. Nauk., Sofia* No. 2, 1957 (451–95). 20 refs. [Bulg.russ.g.]

Experiments were made over two seasons, tapping a total of ca. 1000 trees, mean d.b.h. 46 cm., using 3 main types of face—the German, the Bulgarian V-shaped and a bifurcated face. Detailed results are tabulated. The German face, which was tried in widths from 2 to 5 cm., is recommended and with 5–6 such faces per tree the mean annual yield per stem was 400–600 g. Fungus attacks were observed in the second year, *Discula brunneo-tingens* and *Ophiostoma picea* being isolated. No change in wood properties was observed in most cases after 2 years, but tapping for > 2–3 years is not recommended, because of possible degrade by fungi.

4598. Clements, R. W. **Advance streak—questions raised about effectiveness with acid.** *Naval Stores Rev.* 68 (10), 1959 (6–7).

Studies were established at the Lake City Research Centre in 1954 on the use of an 'advance' streak (both treated and untreated) cut 90, 60 or 30 days in advance of the regular tapping season. In 1957 a further test was established (1) to find whether an acid-treated 'advance' streak increases total resin yield over the first year, and (2) whether the practice influences early-season yields. An acid-treated streak was cut 30 days before the regular tapping season. Observations over the season's tapping showed that the use of an 'advance' streak increased early-season yields, but that, as a result, yields for the rest of the season were reduced proportionally.

4599. Bengtson, G. W., *et al.* **New short-season method produces good yields for gum farmers.** *Naval Stores Rev.* 68 (11), 1959 (6–7).

A method is outlined of short-term intensive tapping of Southern Pines, recommended for farmers unable to spare labour in early spring and late autumn, or for rough and inaccessible or very open stands. Streaks 1½ in. wide are cut every 2 weeks for 6 months (12 streaks in all) and are treated with 65% acid, instead of using the 16 conventional ¾-in. streaks treated with 50% acid. Streaking may begin for Longleaf Pine in mid-April, and for Slash Pine on May 1st. Trials showed that, in general, yields from short-season tapping were ≯ 6% below yields from standard tapping. It is important to remove all acid-killed tissue when cutting each streak, to use the correct acid strength and proper equipment, and not to work a face for > 4 years with the short-season method.

4600. PARAMONOV, A. JA. Dobyvanie živicy v SSSR. **[Resin tapping in the U.S.S.R.]** *Vestnik Instituta po Izučeniju SSSR, München* 1959 (1), No. 29, (96–102). 13 refs. [Russ.] X.

A review of resin tapping in the U.S.S.R., using statistics from a recent source [see *F.A.* 20 No. 1286], and pointing out some instances of techniques copied from other countries.

4601. USTINOVIČ, B. P. Rešitel′no vnedjrat′ v promyšlennost′ progressivnye metody podsočki. **[Progressive methods of resin-tapping must be introduced into the industry.]** *Gidrol. lesohim. Prom.* 10 (2), 1957 (25–7). [Russ.] P.R.

A comparison was made of Pine resin yields during a single tapping season at Sysert, Sverdlovsk province, from (*a*) 18,500 ascending faces, 29 cm. wide, on which narrow ribs of untouched bark are left between successive streaks (made at 10-mm. intervals and 4–5 mm. deep) leaving a ‘ribbed face’ and (*b*) 6000 descending faces, 27 cm. wide, in which continuous streaks (10–11 mm. deep) merge to leave a ‘smooth’ bark-free face. The yield from (*a*) was 0·914 g./sq. cm. compared with 0·648 g. for (*b*), an increase of 41%. Instruments for freshening and their use, and an appliance for spraying H_2SO_4 (found to increase the resin yield 4–4·7 times) are described and illustrated. Both broad ascending faces, and chemical stimulation, are recommended for introduction into general practice as quickly as possible.

4602. DROČNEV, JA. G., and TOBURDANOVSKIJ, A. N. Sravnitel′naja effektivnost′ nishodjaščego i voshodjaščego metodov podsočki. **[Comparative efficiency of descending and ascending methods of resin-tapping.]** *Gidrol. lesohim. Prom.* 10 (3), 1957 (23–4). [Russ.russ.] P.R.

Experiments with [smooth?] ascending and descending faces on the same stem (on a total of 200 trees) showed that, over 2 seasons, yields from the ascending faces were not higher than those from the descending faces. Similar experiments on 50 trees using ribbed faces 20 cm. wide, showed that the yield after one season was 12½% higher from ascending than from descending faces. Experimental removal of a thin strip of bark with cambium, 30 cm. above the central gutter and 4–6 cm. wider than the ribbed face, reduced the yield to 15·7 g. for descending and 15·5 g. for ascending faces compared with 19·3 g. and 22·2 g. respectively for the controls, indicating that resin yield is regulated primarily by conditions of nutrient supply. A study of the physiology of resin-formation and exudation is recommended as relevant to these problems.

4603. OLOVENIKOV, JU. B. Modernizirovannyj ogibajuščij hak No. 5. **[The modernized No. 5 hack.]** *Gidrol. lesohim. Prom.* 11 (2), 1958 (23–5). [Russ.] P.R.

Describes and illustrates a hack of Russian make, having different interchangeable teeth for ascending and descending corrugated faces in which contiguous streaks leave a corrugated, bark-free face [cf. preceding abstract], and for use with chemical stimulants.

4604. KULOMZIN, JU. M. Opyt podsočki voshodjaščimi rebristymi karrami. **[Resin-tapping with ascending ribbed faces.]** *Gidrol. lesohim. Prom.* 10 (3), 1957 (19–20). [Russ.] P.R.

At Syava, Gorki province, resin yields of *Pinus sylvestris* from (*a*) 6200 ascending ribbed faces and (*b*) 7000 descending smooth faces were compared during the 1956 tapping season. The yield per face was 589 g. from (*a*) and 467·6 g. from (*b*). Other data (yields tabulated for 5 months) also show that ascending ribbed faces have a much higher yield than ascending smooth faces. The author recommends widespread adoption of ascending ribbed faces in the U.S.S.R.

4605. ORLOV, I. I. K voprosu o nagruzke podsačivaemyh derev′ev. **[The load [i.e. allowable volume of tissue removed] of tapped [*Pinus sylvestris*] trees.]** *Gidrol. lesohim. Prom.* 11 (2), 1958 (10–1). 3 refs. [Russ.] P.R.

In order to maintain a steady resin flow for an 8- to 10-year tapping period on Scots Pine, the author suggests amending present practices in the U.S.S.R. by reducing the depth of streak from 8 to 4 mm. while increasing the width of the ribbed face from 24 to 32 cm. In order to estimate the effect of tapping on the life and resin yield of the tree a formula is given for the coefficient of the tapping effect, based on the width of heartwood in the tree and the volume (in c.c.) of tissue removed in tapping.

4606. KOMAROVSKIJ, V. N., and TOBURDANOVSKIJ, A. N. Opyt podsočki sosny spiral′noj karroj. **[Tapping *Pinus sylvestris* with spiral faces.]** *Gidrol. lesohim. Prom.* 11 (3), 1958 (11–2). [Russ.] P.R.

In an attempt to increase resin yields, 10-year-old Pine trees were tapped with an ascending spiral face, i.e. with streaks 5 mm. deep, winding 50, 75 and 100% round the tree at an angle of 30–45° from a vertical gutter and at ca. 0·8- to 1-cm. intervals from each other. Three seasons' results (on a 3-day freshening cycle) showed that a spiral face covering 75% of the stem's circumference gave the highest resin yield, averaging 1659 g. resin/face/season. Spiral faces substantially increased the resin yield of the tree, as compared with the normal methods [German face] previously used.

4607. STEPHAN, G. Untersuchungen über den Einfluss der steigenden und fallenden Schnittfolge auf den Harzertrag bei *Pinus silvestris*. **[The effect on the resin yield of Scots Pine of upward and downward streaking sequences.]** *Arch. Forstw.* 7 (10/11), 1958 (848–61). 12 refs. [G.g.russ.e.]

[Cf. *F.A.* 19 No. 454.] Describes, with graphs, a 5-year study (number of faces or stems not given) to resolve this controversy, which in Germany was decided in 1943 in favour of upward streaking, thereby conforming with foreign practice. On the contrary, this study shows, for the 5-year mean yields (with a 28-streak season) a 16·7% superiority for the downward sequence, most of this occurring from the 20th streak. If at the 20th, however, upward streaking is abandoned for downward, a great fall in yield at ca. the 23rd streak obscures the advantage. Faces made at the base of the stem gave lower yields early in the season and higher yields late in the season than faces at 1 m., with equal yields about the 13–20th streaks. Stem temperatures taken between 0 and 2 m. from the base of the stem at 0·5-m. intervals, 2 cm. into the sapwood, indicate that the differences in resin yields are connected with stem temperature as it is affected by soil temperature. The practical recommendations are: that for the better utilization of the stem up to 1–1·5 m., a downward sequence should be worked on this portion. There is room for this for 3–4 years. But as early season yields near the base are low (owing to the cold) upward streaking should be done up to middle of the season in the 3rd–4th years even though there may be a set-back in yield due to the change in streaking sequence. The same should be done for the 4th or 5th years. Thereafter only upward streaking should be done. Similar proposals have been made in the Soviet Union for *P. sibirica* [see *F.A.* 18 No. 2881]. Local factors affecting stem temperature (e.g. heat conduction variations with type of soil and its moisture content etc.) require further study.

4608. SCHULTES, R. E. **Terrain and rubber plants in the Upper Apaporis [basin] of Colombia.** *Suelos ecuatoriales, Medellín* 1 (3/4), 1958 (121–9 + 6 plates). [E.]

River-bank counts and other studies further inland provided a basis for assessing the total numbers of *Hevea* trees in the valley at 16,700,000. The numbers of *Hevea* spp., *Castilloa ulei*, *Manilkara* spp. and *Couma macrocarpa* (all latex-yielding trees) counted along the Naré-Victoria Trocha [trail] are listed, and the ecology of the basin is briefly discussed. Some latex-bearing plants such as *H. nitida* var. *toxicodendroides* and *Senefelderopsis chiribiquetensis* are mentioned, which, although not commercially exploitable because of their small size, yield latex of good quality and may be valuable in hybridization work.

286. Osier-Growing

See also No. 4285.

4609. JEŻEWSKI, Z. Wpływ różnych sposobów użytkowania plantacji wikliny na rozwój korzeni i plonowanie. **[The effect of different methods of Osier plantation management on root development and yields.]** *Sylwan* 103 (2), 1959 (61–71). 18 refs. [Pol.russ.e.]

Trial plots and commercial plantations were: (*a*) cut annually, (*b*) cut every year except for the 1st, 7th, 13th, etc., (*c*) cut every year except for the 2nd, 8th, 14th, etc. Methods (*b*) and (*c*) resulted in considerably greater root weights and better root-system development. In the 4th year, the yield from (*c*) was 30% greater than that from (*a*). [Cf. *F.A.* 17 Nos. 3993–4.]

4610. KANNENBERG, H. Korbweiden leiden unter Kupfermangel. **[Cu deficiencies in Osier Willows.]** *Holzzucht, Reinbek* 13 (2), 1959 (10–1). [G.]

Describes pot tests in peat soils well supplied with macro-nutrients and with Cu in varying amounts and forms. Cuttings of *Salix viminalis* in Cu-free control pots developed poor form, grew slowly and did not mature. Yields (i.e. weight of 1-year-old shoots) 4 years after fertilizing with the Cu-containing 'Excello' were 135 g./pot after 30 kg./ha., 110 g. with 3 kg./ha. and only 41 g. in controls. Other Cu fertilizers increased growth less. Yields of 2-year cuttings after 5 years followed a similar pattern. It is suggested that Cu-deficiencies occur quite frequently in Osier beds.

287. Bamboo and Cane Growing etc.

See also Nos. 5028, 5323.

4611. MCCLURE, F. A. **Bamboos for the Pacific islands.** *SPC Quarterly Bulletin, Sydney* 8 (2–4), 1958 (20–2, 56–7; 40–2; 53–5). 19 refs. L.C.O.

Discusses propagation, cultural requirements and the presence of cyanogens in young shoots, describes the following species considered suitable for trial in the S. Pacific area (with drawings of their culm sheaths), and discusses their uses: *Bambusa dissimulator*, *B. malingensis*, *B. pervariabilis*, *B. textilis*, *B. tulda*, *B. tuldoides*, *B. ventricosa*, *Gigantochloa apus*, *G. verticillata*, *Melocanna baccifera* and *Ochlandra tranvancorica*.

288. Crops Grown for Animal Products

4612. KRISHNASWAMI, S., and SAIKIA, D. R. **Lac cultivation in Assam with notes on the use of Arhar (*Cajanus cajan*) and other species as lac hosts.** *Indian For.* 85 (5), 1959 (294–300 + 5 photos). 4 refs.

3. WORK SCIENCE (WORK STUDIES). HARVESTING OF WOOD: LOGGING AND TRANSPORT. FOREST ENGINEERING

30. Work Science (Work Studies): General

302. Man and Work (Physiology and Psychology)

4613. WESTBERG, P., and ÅKELUND, I. Säsongvariationer i fysisk arbetsförmåga hos fast anställda skogsarbetare och studenter. **[Seasonal variations in the physical working capacity of forest workers and students.]** *Rapp. Avd. Arbetslära SkogsforsknInst., Stockh.* No. 5, 1958. pp. 57. 13 refs. [Sw.e.]

Studies on forest workers, using a bicycle ergometer, showed that their physical condition improved during periods of heavy work, reaching a maximum in March, and decreased during periods of lighter work or after holidays. Studies on students were less complete but showed similar results.

4614. QVENNERSTEDT, H., and ZENK, P. O. Några arbetsfysiologiska laboratorieundersökningar. **[Some laboratory studies on the physiology of work.]** *Rapp. Avd. Arbetslära SkogsforsknInst., Stockh.* No. 4, 1958. pp. 41 + 13 gphs., 5 photos. 9 refs. [Sw.e.]

Subjects studied were the effect of: (1) the weight of protective boots on oxygen intake; (2) various types of waterproof clothing on body temperature, pulse, sweating rate and O intake; (3) loads of various weights, variously carried, on speed of work, O intake, pulse rate etc.

4615. HANSSON, J. E. Försök med snöskor i skogsarbete. **[Studies of snow-shoes for forest work.]** *Rapp. Avd. Arbetslära SkogsforsknInst., Stockh.* No. 3, 1958. pp. 18 + 3 gphs., 4 photos. 4 refs. [Sw.]

Presents tabulated results on working time and oxygen consumption in clearing snow from round the stem, felling, trimming, cross-cutting and barking, with and without snow-shoes, concluding that if much moving from place to place is involved, snow-shoes are advantageous when men working without them sink into the snow to a depth of 30–50 cm., especially in more open stands. Snow-shoes are less effective in very loose snow. Size and shape of snow-shoes are discussed. [Cf. *F.A.* 17 No. 2834.]

304. Hygiene. Safety; Accidents and their Prevention

See also Nos. 5174–5, 5447–8.

4616. GOODWIN, J. F., and BETTERTON, S. J. **Safety in forestry operations.** *Quart. J. For.* 53 (2), 1959 (123–8).

A general article [cf. *F.A.* 20 No. 547] discussing mental control over muscular activity; the importance of stance; lifting, carrying, balancing and gripping actions.

4617. SIMONS, S. J. **Report on black fly control at Baie Comeau, Que.** *Pulp Paper Mag. Can.* 60 (4), 1959 (216 . . . 220, 230).

Aerial control measures, using DDT solutions, were undertaken in 1956–58 against larvae and adults on an area of 44 sq. miles, including inhabited areas. Details of costs (ca. $155/sq. mile) are given. [Cf. *F.A.* 20 No. 548.]

4618. LEWIS, L. F., and EDDY, G. W. **Control of mosquito larvae in log ponds in Oregon.** *J. econ. Ent.* 52 (2), 1959 (259–60). 3 refs.

Modern truck logging tends to concentrate sawmills near population centres, where ponds range up to 100 acres in area. The mosquitoes are mainly Culicidae, one species of which is locally reported to have developed DDT resistance. A dosage of 6 lb./acre of DDT, heptachlor, and malathion gave respectively 3–6, 5–10, and 2·5–6 weeks' protection.

305. Sequence of Work and Performance (Time and Performance Tables, Evaluation of Work)

See Nos. 4508, 4627.

307. Tools, Equipment, Machines and Working Animals: General

See also Nos. 4458, 4487, 4497, 4603, 4735.

4619. HUGGARD, E. R., and OWEN, T. H. **Forest machinery.** Adam & Charles Black, London. 1959. pp. xii + 192. Price 24*s*.

Designed primarily for the British forester, the book surveys the whole field, covering economics, application and operation of machinery, with separate sections for nursery equipment, land preparation and forest establishment, road construction, felling and rough conversion, extraction, protection, and ancillary machinery and apparatus. A list is given of 117 major firms, British and foreign, consulted during the preparation of the book.

4620. PAVELESCU, I. M. [Editor.] Sistema de maşini şi instalaţii pentru lucrările de exploatarea şi transportul lemnului. **[Machines and installations for the felling and transport of timber.]** Editura Agro-Silvica de Stat, Bucharest. 1958. pp. 39 + 175. [Rum.]

Consists mainly of (*a*) tabulated data, with country of origin, on machinery arranged according to types of operation, assortments etc., and (*b*) >80 photographs and specifications of power saws, winches, tractors, lorries, cableways, railway rolling-stock etc. A similar volume on machinery for silvicultural operations, soil conservation etc. is in the press.

4621. **Equipment section.** *Unasylva* 13 (1), 1959 (54–6).

Includes descriptions, with photographs and specifications, of: Mechanical winch M.F.10, suitable for use on very steep slopes (Éts. F.O.C., Vienne, France); HM diesel crawler tractor equipped with drill-drawing attachment suitable for nursery use (Eimeha Herbert Boschke K.G., Düsseldorf); Record-800 automatic barker for veneer logs (Sté. des Éts. Rennepont, Paris); British Straddle Carrier MK.2 (British Straddle Carrier Co. Ltd., London).

308. Planning (Organization) of Work

See No. 5052.

31. Logging and Transport: General

See also Nos. 5053, 5319, 5405.

4622. SIMMONS, F. C. **Bibliography of literature on logging in the English language since World War II (1914–1957). Preliminary review edition.** Forest Products Research Society, Madison. 1958. pp. ix + 129. Many refs.

Contains nearly 2000 references from ca. 100 publications, classified according to the Oxford system (including scaling and log grading), based largely on the yearly reviews published in *For. Prod. J.*

4623. BOWLES, W. D. **Understanding the Soviet lumbering industry.** *Timber of Canada* 19 (11), 1958 (39–43, 46–47). 18 refs.

Refutes, from a 3-year study of Russian sources, many of which are quoted, the glowing account of this industry presented by a Canadian logger to the New Brunswick legislature.

4624. KOROLEFF, A. **Logging mechanization in the U.S.S.R. II.** *Woodl. Res. Index Pulp Pap. Res. Inst. Can.* No. 110, 1959. pp. 257. 200 refs.

[Cf. *F.A.* 14 No. 2271.] Reviews: the forest and its utilization, the reform of the logging industry, logging (machinery, organization and techniques), and water transport, on the basis of nearly 200 articles (mainly from *Lesn. Prom.*). Translations or digests of 9 articles and leaflets are included as appendices.

4625. Symposium: Exploitation forestière. [**Symposium on forest exploitation.**] *Texte Conf. 38ᵉ Assembl. ann. Corp. Ingén. for. Québec* 1958 (72–112). [F.]

Includes papers and discussions on: the influence of modern logging operations on the forest (*F. Rivard*); the teaching of forest exploitation at the University (*G. E. Lamothe*); silvicultural aspects of logging operations (*L.-J. Lussier*); different methods of hauling pulpwood by lorry.

4626. MARTINENCQ, L. Les caractéristiques et l'avenir de l'exploitation forestière au Moyen-Congo. [**The characteristics and future of forest exploitation in the Moyen Congo.**] *Bois et Scieries: Numéro spécial 'Foire de Paris'*, 1959 (35 . . . 45). 6 refs. [F.]

Chiefly describes the organization of logging operations and transport, labour conditions etc.

32. Felling and Related Operations

321. Marking

4627. LUNDGREN, A. L. **Costs of marking Black Spruce for cutting in N. Minnesota.** *Tech. Note Lake St. For. Exp. Sta.* No. 546, 1959. pp. 2.

Statistical analysis showed that it took nearly twice as long to mark a cord of Black Spruce under the shelterwood system and nearly five times as long under light selection fellings, in both of which individual trees were marked, as under a clear-felling system where only area boundaries were marked.

322. Felling Season. Preparatory Measures.

See also No. 4631.

4628. LOHREY, R. E. **Debarking Bigtooth Aspen with 2,4-D amine salt.** *Tech. Note Lake St. For. Exp. Sta.* No. 550, 1959. pp. 2.

Tests showed that 2,4-D applied weekly at full strength or in a 50% water solution to frill girdles was an effective substitute for Na arsenite, and loosened Aspen [*Populus grandidentata*] bark until the end of July. A 25% concentration was effective only during treatments in June.

323. Felling and Subsequent Primary Conversion

See also Nos. 4631, 4632–8, 4644, 5048.

4629. GALEWSKI, W., and MONKIELEWICZ, L. Teoretyczne podstawy ścinki drzew obciążonych mimośrodowo. [**The theory of felling excentrically stressed trees.**] *Sylwan* 102 (3), 1958 (1–12). [Pol. russ.e.]

As trees with regular axial stress are rarely encountered in practice, this theoretical investigation is limited to excentrically stressed trees (leaning stems, trees with one-sided crowns etc.), distinguishing here between trees for which the angle, in the horizontal plane, between the direction in which the tree would tend to fall by gravity and the chosen direction of felling, is (*a*) < or (*b*) >90°. It is concluded that, in both cases, an initial cut should be made on the compression side; in case (*b*) the trees should be pulled through the vertical position while being cross-cut; in case (*a*) the cross-cut should not be complete, in order to bring about an artificial lean coinciding with the direction of felling. This latter point is still under investigation.

33. Degree of Utilization and Waste. Clearing the Felling Site. Harvesting of Small Wood. Salvage Fellings

See Nos. 4418, 4644, 4676, 4730, 4735, 5035, 5048, 5358–9.

34. Storage of Wood in the Forest and at Log Dumps ('Landings')

See also Nos. 5274–7, 5303–4.

4630. FIOŁEK, S. Pękanie drewna sosnowego na zrębie. [**The development of shakes and splits in Pine logs on the felling site.**] *Prace Inst. bad. Leśn.* No. 187, 1958 (65–91). 7 refs. [Pol.russ.e.]

[Cf. *F.A.* 18 No. 1663.] Observations in mid-July on 26 barked logs that had been felled on June 25, showed that: (1) splits and shakes were smaller when the logs were on the ground than when raised 50 cm. above it; (2) leaving a strip of bark 50 cm. wide at the ends of the log had little or no effect on splitting; (3) orientation of logs so that the butts pointed to the N., felling the trees close to the ground, and covering the cut ends of logs with branches, all tended (individually and in combination) to reduce splitting.

4631. HEISKANEN, V. Kesäaikana valmistettujen mäntysahatukkien ja -paperipuiden kuivuminen ja säilyminen; v:n 1957 kokeiden tuloksia. **[Seasoning and preservation of Pine sawlogs and pulpwood prepared in summer; results of experiments in 1957.]** *Metsät. Aikak.* 1959 (2), (50–4). [Fi.e.]

In a series of pilot experiments which will last some years, (1) blue-stain and rot occurred in sections from the middle of pulpwood logs felled between April and July/Aug., partly barked logs showing more staining but less rot than unbarked ones; (2) ends of sawlogs felled in Sept. or earlier showed staining; (3) unbarked sawlogs showed less rot than partly barked ones, because of differences in seasoning conditions; (4) partly barked sawlogs felled in July or earlier, and unbarked ones felled in April-May, were badly damaged and yielded little defect-free material; those felled later yielded material practically free from defects after shortening by 1–3 ft.

35. Performance Measurements for Determining Piece Rates in Felling and Related Operations

See also No. 4553.

4632. BLIGHT, T. D. **Time studies of Pine logging operations in the Australian Capital Territory.** *Aust. Timb. J.* 25 (2), 1959 (10, 15 . . . 27).

The operations involved in felling (2·81), trimming to a 4-in. top (2·30), dragging by horse mainly on down slopes of 5–14° (1·90), cross-cutting with bow saws (4·45) and loading on to trucks (6·45) were timed, the bracketed figures being the net totals in man-minutes/100 bd. ft. for 8- and 12-ft. *Pinus radiata* logs. Each operation and its correlations are discussed in detail and graphed.

4633. ROŽIN, N. I., and IVANOVSKIJ, B. A. O čislennom sostave malyh kompleksnyh brigad. **[The numbers of men in small mechanized logging teams.]** *Lesn. Prom.* 1959 (5), (15–7). [Russ.]

Time studies and examination of the volume output per man-day and per tractor-shift of logging teams of 5, 7, 9 and 11 men, showed that under Soviet conditions, the output per man-day decreased with increasing team size, and that the optimum size of a team was 5 men.

4634. FIOŁEK, S. Wpływ różnych czynników na pracę pozyskiwania drewna. **[The influence of various factors on logging efficiency.]** *Roczn. Nauk leśn.* No. 22, 1958. pp. 231 + 12 tbls. 20 refs. [Pol.russ.e.]

Presents the results, in graphs and histograms, of work-study investigations on labour efficiency in felling, cross-cutting, trimming and barking Pine and Spruce, as influenced by the season, tree size, the type of felling, state of timber (living, decayed or dead), clear bole length, air temperature, snow etc and discusses the relative advantages of power and hand-saws.

4635. BENIĆ, R. Istraživanja o potrošku vremena za čišćenje debla od grana i za guljenje kore kod ljetne sječe jelovine u Gorskom Kotoru. **[Time studies of trimming and barking Silver Fir in summer fellings in Gorski Kotor.]** *Glasn. šumske Pokuse* No. 13, 1957 (249–79). 22 refs. [Serb.e.*e*.]

Results are tabulated, and on their basis an equation is derived for calculating the time required for trimming and barking according to mean diam. of the stems. A comparison of iron and wooden barking tools showed that the former made a 36% saving in time.

4636. MAKKONEN, O. Työntutkimuksia halkojen ja polttohakerankojen hankinnasta. **[Work studies on logging split fuelwood and long logs for fuel chips.]** *Julk., Metsäteho, Helsinki* No. 41, 1959. pp. 43. [Fi.e.*e*.]

Presents tabulated results of time studies on felling, preparation (trimming, cross-cutting, splitting, barking and stacking), and hauling (including loading and unloading) of 3373 long logs [cf. *F.A.* 18 No. 2914] including trimmed and untrimmed long logs of small diameters (d.b.h. 3–10 cm.), trimmed long logs of mixed diameters (3–10 and 11–20 cm.), and trimmed fuelwood (diam. <10 cm.) from the top part of fuelwood trees, and of split Birch fuelwood (top diam. 5, 7 and 10 cm.) from 486 stems. The long logs were chipped after hauling; mean chip amounts varied from 2·7 cu.m. (total volume, including air space) for trimmed logs to 3·7 cu.m. for untrimmed, per solid cu.m. of stem. Working times (felling, preparing and hauling for 100 m.) were considerably lower for long logs (116·93–154·19 min. per cu.m. solid wood) than for split fuelwood (188·92–205·63 min.). Working times for chipped wood (expressed in time per cu.m. chips) were lower for untrimmed than for trimmed logs. Results are compared with those from [unpublished] Swedish studies.

4637. ARATAKE, T., and AOYAGI, A. **[A report on time studies on felling and logging operations of Oak trees.]** *Rep. Kyushu Univ. For.* No. 9, 1958 (57–70). [Jap.jap.e.]

Presents results of a time-study carried out in 1955 in Oak stands in the Hokkaido Instruction Forests. A close relation was found between tree size and felling and logging time, the time increasing with size at b.h. Output decreased with increasing age of the worker. Length of logs produced had no effect on output. A performance table was prepared, but values may be rather too high. *From authors' summary.*

4638. SHIIBA, H. **[A report of a time study of felling and logging operations of Japanese Cedar [*Cryptomeria japonica*] trees.]** *Rep. Kyushu Univ. For.* No. 11, 1958 (31–48). 4 refs. [Jap.e.]

Presents results of a study in July and August 1957 at the Kasuya experimental forest. The main factor affecting output proved to be: (1) d.b.h., the time taken for felling and logging tending to increase linearly with increasing d.b.h.; (2) difference between individual workers, the factors responsible remaining undetermined; (3) slope of the site, time taken being 20–25% greater on steep than on gentle slopes; (4) direction of felling, affecting only logging operations; and (5) the length of stem carrying live branches. Tree height seemed not to affect felling and logging time. A standard output table from the mean values for 5 workers, and further tables for gentle, medium and steep slopes were prepared.

36. Tools, Machines and Equipment for Felling and Related Operations

See also Nos. 4553, 4619–21, 4635, 5198.

4639. **Provisional protocol for the testing of barking machines.** [*Publ.*] *FAO/EFC Pilot Comm. Logging Tech.* No. *FAO/ECE/LOG*/31, 1959. pp. 6.

4640. Walker, J. F. **Mechanizing woodlot production on Manitoulin Island.** *Pulp Paper Mag. Can.* 60 (5), 1959 (156 . . . 168).

Presents a detailed analysis, including costs, of the work of the Cambio 35 barker on 4-ft. Poplar pulpwood, 1956–58. A rate of 10 barked cords/hr. was achieved and maintained, the maximum rate being 15 barked cords/hr. In the 1957 season, the rate per man-hr. was 0·65 and, in 1958, 0·73 barked cords. Also describes the design, performance and operating costs of tubular steel pallets (cost ca. $600 each) for lorry transport, mainly of pulpwood. In view of the increasing shortage of private lorry transport, the prospects for wider use of such pallets are good.

4641. Die maschinelle Handentrindung von Sägerundholz. **[Mechanical hand tools for the barking of sawlogs.]** *Holz-Zbl.* 85 (36), 1959 (454). [G.]

Describes (1) a hand tool powered either by a 0·85-h.p. petrol engine or a 0·5-h.p. electric motor, which works like a barking iron with short, fast, oscillating pushing strokes. It has a knife of flexible bandsaw steel, allowing removal of whole strips of bark. If a serrated edge is used, knots etc. can be smoothed. It weighs 12 kg. [Cf. *F.A.* 19 No. 3048.] (2) A tool with an electric drawknife on a cable [cf. *F.A.* 19 No. 1802]. Both tools are said to work 2–3 times as fast as hand tools on autumn- and winter-, and 4–5 times as fast on spring- or summer-felled timber.

4642. **Provisional protocol for the testing of power saws.** [*Publ.*] *FAO/ECE Jt. Comm. Working Tech.* No. *FAO/ECE/LOG*/30, 1959. pp. 14. [E.*e. f.russ.*]

4643. Jindra, J. **The use of power saws in forest operations (3rd report).** [*Publ.*] *FAO/ECE Jt. Comm. Working Tech.* No. *FAO/ECE/LOG*/57, 1959. pp. 33 + 3 + 25 photos & drawings, 3 gphs. 39 refs. [E.]

[Cf. *F.A.* 18 No. 484.] Adds 39 references later than 1955, and further power-saw manufacturers. The general trend in saw design is towards one-man operation.

4644. Fujibayashi, M., and Okawara, S. **[On lumbering operations by chainsaw in a forest damaged by storm.]** *Misc. Inform. Tokyo Univ. For.* No. 12, 1957 (121–31). 7 refs. [Jap. jap.e.]

Efficiency depended largely on workers' ability, but could be expected to be at least twice that of hand sawing, with less fatigue.

4645. **Work study in forestry.** Forestry Commission, London. 1958. pp. 3.

Summarizes two reports by the Work Study Section, one of which recommends greater use of short-shaft and lighter axes, and the other an improved quarter-girth tape, which gives the rounded-down quarter-girth directly and much more clearly.

4646. Kepšta, D. Vývoj a prevádzkové zhodnotenie československého mechanizmu pre štiepanie rovnaného dreva. **[The development and practical evaluation of Czechoslovakian machines for splitting round wood.]** *Lesn. Čas.* 5 (1), 1959 (44–70). 10 refs. [Slovak.]

Describes several Soviet machines and also the PHŠ wedge-type Czech splitter, giving its specifications, performance with logs of 20–60 cm. diam., and a cost analysis of its operation.

4647. Charlesworth, W. J. **Portable fuelwood splitter.** *Woodl. Sect. Index Canad. Pulp Pap. Ass.* No. 1820 (*B*-7-*c*), 1958. pp. 3.

Describes and illustrates the splitter, which consists basically of a wedge mounted on a sturdy engine-driven wheel rotating at 25 r.p.m., and a splitting table on which the fuelwood bolts are placed.

37. Transport

372/377. Land Transport

See also Nos. 4619–21, 4632–3, 4640, 5048–50.

4648. Leijonhufvud, A. C. **Some views on the mechanization of hauling operations in the field of forestry.** *Transl. For. Prod. Lab. Can.* No. 127, 1959. pp. 8. Transl. from *Meddelande Forskningsstiftelsen Skogsarbetens och Kungl. Domänstyrelsens Arbetsstudieavdelning* (*S.D.A.*) No. 59, 1958 (1–14). [Cf. *F.A.* 19 No. 4277.] Limited distribution.

4649. Gecow, R. Transport paczkowanej drobnicy. **[The transport of small, packaged timber.]** *Sylwan* 103 (1), 1959 (49–52). 1 ref. [Pol.]

Reports time studies in transporting bundles of logs (lengths 1–2 m., diam. 20–25 cm.) for various distances up to 400 m. by horse-drawn carts, tractor-trailer units, lorries, and large wagons.

4650. Weatherhead, R. **Some considerations on log-loading equipment and techniques.** *Repr.* from *New Zealand Engineering, Wellington* 12 (10), 1957 (328–36).

An illustrated account of various types of equipment with special reference to New Zealand conditions.

4651. Ajzenberg, A. I., and Faller, A. N. Gruzospusknoj baraban dlja paketnoj pogruzki hlystov. **[A [multi-disk clutch] drum for lowering bundles of tree-length logs [on to lorries].]** *Lesn. Prom.* 1959 (4), (3–6). [Russ.]

Describes a hand-operated winch with a multi-disk clutch. Bundles of logs are skidded by tractor to the lorry road and one end of the bundle is hauled up to the top of a spar by the tractor with a cable via the winch. The drum is then locked, leaving the bundle suspended. When the lorry arrives it is backed under the load, the driver himself lowering the bundle on to the lorry via the clutch-controlled winch. This arrangement eliminates the time wasted by the tractor having to await the arrival of the lorry at the loading point. Three variants of this basic method are described. The winches are reckoned to pay for themselves in 20–25 days' use.

5652. STAJNIAK, J. Próba ustalenia przydatności wciągarki jednobębnowej z silnikiem S-60 do załadunku drewna. **[A trial of the usefulness of the S-60 one-drum motor winch for loading logs.]** *Prace Inst. bad. Leśn.* No. 185, 1958 (35–46). 5 refs. [Pol.russ.e.]

Gives specifications of the winch, data on the organization of work in loading railway wagons, and test results, including time-study data.

4653. TIMOFEEV, R. D. Torcovyj grejfer. **[A grab that holds logs by their ends.]** *Lesn. Prom.* 1959 (2), (7). [Russ.]

The grab, used with the KKU-7·5 crane [cf. *F.A.* 19 No. 4263], has two parallel vertical face-plates (1 × 1 m.) which converge on and grip the two ends of the stack. When lifted and swung by the crane into position, the logs are released electrically. After modifications, e.g. increasing the gripping surface of the plates, the grab will probably be mass-produced.

4654. 'Liftomat'—ein Gerät zum Verladen von Schichtholz. **['Liftomat', a pulpwood loader.]** *Holz-Zbl.* 85 (77), 1959 (1011). [G.]

Describes a simple loading device of German manufacture, consisting of an iron frame, a conveyor chain with lifting tines, and a 2·5-h.p. petrol engine. It can make ca. 12 lifts a minute, takes a maximum load of 150 kg. and loads to a maximum height (adjustable) of 4 m. Weighing ca. 80 kg. it can easily be dismantled and carried on lorry or car. [Cf. *F.A.* 18 No. 1708.]

4655. JAKOBSSON, B. Rationaliseringsförsök med massavedstransporter på lastbil. **[Studies on rationalizing lorry transport of pulpwood.]** *Skogen* 46 (8), 1959 (178). [Sw.]

Describes, with illustrations and specifications, a crane for loading stacked, loose pulpwood on to both lorry and trailer; it is mounted on the back of a lorry and supplied with a grab. Loading time for one man was 2½–3 min./cu.m.

4656. FLÖGL, S. Brzina klizanja u zavojicama šumskij klizina. **[The rate of sliding in timber-chute curves. [A mathematical analysis.]]** *Glasn. šumske Pokuse* No. 13, 1957 (281–350). 6 refs. [Croat.g.]

4657. HERMAN, F. R. **Logging in high-altitude forests of the Central Rocky Mountains.** *Proc. Soc. Amer. For.*, 1958 (1959), (19–21).

Mainly a description of 2 years' experimental operation of a Wyssen W.30 Skyline crane, including output, costs etc., and similar data from a miniature gravity slack-line system with a capacity of 4800 bd. ft./8 hours.

4658. MINKOW [MINKOV], N., *et al.* Nomographische Ermittlung der Zugkräfte am beiderseitig festverankerten Tragseil des Wyssen-Seilkranes. **[Nomograms for the determination of loading stresses in the skyline of Wyssen cableways, anchored at both ends.]** *Allg. Forstztg.* 70 (5/6), 1959 (57–60). 3 refs. [G.]

Presents formulae and nomograms to assist in determining maximum loads, dimensions of cables etc. in relation to length of span, slope, temperature etc.

4659. VORONITSIN [VORONICYN], K. I., ALIABIEV [ALJAB′EV], V. I., and PERFILOV, M. A. **Ground winch skidding in clear and selective felling.** [*Publ.*] *FAO/ECE Jt. Comm. Working Tech.* No. *FAO/ECE/LOG*/37, 1959. pp. 11 + 11 dgms. 1 ref. [E.e.]

Describes and illustrates the TL-5 winch, and its installation for skidding timber (*a*) in clear-felling, and (*b*) in selection-felling operations. Details of labour requirement, costs and production are given, the latter usually reaching 18 cu. m. wood per man-day. Depending on the ratio of trees felled to those left standing in selection work, output drops by 20–50% compared with clear felling. The use of 'truck combines' (i.e. reinforced lorries having a mounted winch) for skidding, loading and transport is also discussed.

4660. APANASENKO, I. S., and ŠUR, M. G. Stanok dlja rezki trosov. **[A machine for cutting cables.]** *Lesn. Prom.* 1959 (4), (21–2). [Russ.]

Describes, illustrates and gives the specifications of the SRT-2 cable cutter, which can sever wire cables of 9–35 mm. diam. at a mean cutting rate of 2 mm./sec. by means of a 3-mm.-thick steel disk, electrically driven at 2880 rev./min.

4661. **Protocol for the testing of winches.** [*Publ.*] *FAO/ECE Jt. Comm. Working Tech.* No. *FAO/ECE/LOG*/25 rev. 1, 1959. pp. ii + 5 + 1. [E.] Price $0.10.

Drawn up in Dec. 1958 on the basis of experience gained in the different countries in trying out the draft tests in the provisional document [see *F.A.* 20 No. 590].

4662. Aktuelle vinsjer for skogbruket. **[Winches for forestry.]** *Norsk Skogbr.* 4 (5), 1959 (142, 145–7). [Nor.]

Describes, with illustrations and specifications, 3 makes of power winch, mounted on sledges or wheels, and 4 tractor-mounted winches, all made in Norway.

4663. NOEL, L. Un treuil forestier de halage commandé par radio. **[A radio-controlled forest winch.]** *Rev. Bois Appl.* 14 (2), 1959 (65). [F.]

Description of the design and operation of the winch, which was demonstrated at the Stockholm Fair. [Cf. *F.A.* 18 p. 585.]

4664. SCHLAGHAMERSKÝ, A. Výpočet potřebného výkonu motoru navijáku pro malou lanovku. **[Calculation of winch motor power for a small cableway.]** *Sborn. čsl. Akad. zeměd.* (*Lesn.*) 4 (7), 1958 (605–24). [Cz.cz.russ.g.]

Detailed calculations of winch requirements for maximum loads of 1000 and 2000 kg.

4665. ORLOV, S. F., and GOL′DBERG, A. M. Sravnenie parametrov tjagovoj dinamiki lesotransportnyh sistem. **[Comparison of the parameters of the draught dynamics of timber transport systems.]** *Lesn. Prom.* 1959 (4), (12–7). [Russ.]

Compares the draught-dynamics parameters of different methods of timber transport by a detailed mathematical analysis, distinguishing four basic methods: i.e. where the load is (1) entirely on the ground or entirely on a trailer; (2) partly on the prime mover and partly on the ground; (3) partly on the prime mover and partly on a trailer; or (4) entirely on the prime mover. In each of the four methods, a distinction is made between wheeled and crawler prime movers. Data on group (4) are as yet meagre. It is concluded that (3) shows the best results generally, though some of the other methods (e.g. (2) with crawler tractors) are also useful for the transport of whole trees, for which, with no skidding, (3) is also recommended and (4) shows promise.

4666. VORONITSIN [VORONICYN], K. I., LEPENTZOV [LEPENCOV], P. A., and PERFILOV, M. A. **Timber skidding by [crawler] tractor in the USSR.** [*Publ.*] *FAO/ECE Jt. Comm. Working Tech.* No. *FAO/ECE/LOG*/59, 1959. pp. 21 + 17 photos, 4 dgms. [E.e.]

Gives detailed descriptions and specifications of the TDT-40, TDT-60, S-80 and T-140 crawler tractors; describes methods and efficiency in skidding; the use of tractors for road haulage; compares skidding methods, i.e. using arches, skidding with butts or tops forward in full-tree logging, etc.; organization of work at landings; labour requirements and logging costs; and the development of felling-and-skidding machines [cf. *F.A.* 19 No. 1796]. A similar report on wheeled tractors in the U.S.S.R. is to be published later.

4667. KEYS, G. T. **Small crawler tractor problems and their solutions.** *Woodl. Sect. Index Canad. Pulp Pap. Ass.* No. 1861 (*B*-8-*f*), 1959. pp. 2 + 5 + 2

[Cf. *F.A.* 17 No. 4033.] A report by the Association's tractor committee after a questionnaire on users' complaints and discussions with the manufacturers. The problems, the industry's solution, and the makers' action, are listed in detail for John Deere, Oliver, and J. I. Case machines, and for the Bombardier J-5 tractor.

4668. DZIUBAK, W. Próby organizacji ruchu wahadłowego przy wywozie drewna. **[Trials in the organizing of continuous work in timber transport.]** *Prace Inst. bad. Leśn.* No. 184, 1958 (21–32). [Pol.russ.e.]

Reports data from a trial made by the Słupsk Forest Transport Unit in 1955 to compare the efficiency of transporting timber for 14 km. with (*a*) 1 tractor + 1 trailer + 3 workers; (*b*) 2 tractors + 4 trailers + 7 workers; (*c*) 2 tractors + 6 trailers + 10 workers. The amount of timber transported per man, per tractor, and per trailer, taking (*a*) 100, were (*b*) 140·7, 160, and 80, and (*c*) 98, 160 and 53·2 respectively.

4669. LEPENCOV, P. A. O parametrah guseničnonyh trelevočnyh traktorov. **[The specifications of crawler tractors for skidding.]** *Lesn. Prom.* 1959 (1), (18–22). 1 ref. [Russ.]

On the basis of N. American experience, and Russian investigations with TDT-60 and TDT-140 crawler tractors, the author analyses the influence of (*a*) load per trip, (*b*) speed of travel under load, and (*c*) tractor power, on the output of trees skidded, and the costs per shift. Differences due to variations in ground surface, size of trees, and skidding distances are taken into consideration, and the results graphed.

4670. MATUSZ, S. Przystosowanie ciągnika Ursus do prac hodowlanych w gospodarstwie leśnym. **[Adaptation of the Ursus tractor for forest work.]** *Prace Inst. bad. Leśn.* No. 183, 1958 (1–18). [Pol.russ.e.]

After preliminary trials of the Polish Ursus agricultural tractor with W. German and Russian tractors under forest conditions, main comparative trials were made on the Ursus, the Russian KD-35 and the Czech Zetor tractors. Investigations covered manoeuvrability, wheel-slip, and ability to pass over stumps and overcome difficult terrain. On the basis of the results of these trials, modifications to the wheels and chassis of the Ursus, and some new and improved ancillary equipment for it, are recommended.

4671. LEGAŃSKI, M. Nowe ciągniki 'Ursus'. **[New Ursus tractors.]** *Las Polski* 32 (3), 1958 (18–20). [Pol.]

Describes three new Polish forestry tractors, the 4-wheeled Ursus C-451 and C-325, and the 2-wheeled Ursus C-308, with notes on performance.

4672. CERMAK, F. **Actual trends in tractor logging.** *Rimba Indonesia* 7 (10/12), 1958 (453–61). [E.]

Discusses the difference in costs (rates of depreciation, delivery costs, repairs, fuel, wages etc.) of tractor logging in temperate and tropical zones. For the latter, medium-heavy (ca. 100-h.p.), wheeled tractors, with interchangeable accessories and with diesel engines are recommended.

4673. **Clark introduces timber tractor.** *Sth. Lumberm.* 198 (2472), 1959 (64).

Describes the 100-h.p. 'Michigan' model 75 developed by the Clark Equipment Co., Benton Harbor, Mich. This rubber-tyred tractor has 4-wheel drive, 4 speeds (up to 29·6 m.p.h.) forward and reverse, fore and aft controls and steering, logging arch, cable-and-winch with 15,500 lb. pull and a hydraulically controlled blade (anchor and butt-plate). It pivots in the middle and its front half can be pushed away from its rear half by hydraulic cylinders. It can zig-zag through a forest and describe a circle in less than its own 21-foot length.

4674. SÖDERLUND, J. A., and WICKSTRÖM, R. Hjultraktorn i transportarbete. Markgrepp och slirning vid körning med olika däckstyper på olika underlag. **[Wheeled tractors in transport work. Ground adhesion and slip with different tyres on different ground surfaces.]** *Svenska SkogsvFören. Tidskr.* 57 (1), 1959 (121–70). [Sw.e.*e.*]

Eight types of tyres, 13 × 30 in. were tested on a 40-h.p. Swedish Belastad diesel tractor, model BM35, of 2450 kg. net weight. Rear-axle pressures under test conditions were 1800 and 2340 kg. On the 4 surfaces tested, ground adhesion was only slightly affected by rear-axle pressure. It was greatest on an asphalt road, least on a soft gravel road, and greater on grassy ground than on the forest floor. The difference between tyre types was not very great, though two types having larger contact surfaces gave somewhat better performances under constant pull. Slipping on soft substrates occurred even at very low pulls. Estimates of practicable loads, based on these findings, are appended.

4675. MALMBERG, C. E. Olika fordons framkomlighet och användbarhet i snö eller på därmed jämförliga underlag. **[Performance of different vehicles and their value on snow or similar surfaces.]** *Norrlands SkogsvFörb. Tidskr.* 1959 (1), (33–92). [Sw.e.*e.*]

Tests were made of performance (e.g. speed, steering, climbing power, turning) on compressed and soft snow, uncleared land etc. of about 24 wheeled, tracked, half-tracked and special tractors. Factors found to affect performance included bearing strength of the snow, weight and equilibrium of the vehicle, wheel size or track pressure, and ground clearance. The value of careful lay-out of the road system and preliminary snow packing, is stressed. Results are tabulated.

4676. FUJIBAYASHI, M., OKAWARA, S., and SUZUKI, M. **[Tractor logging operation for the utilization of timbers damaged by storm.]** *Misc. Inform. Tokyo Univ. For.* No. 12, 1957 (95–119). 16 refs. [Jap.jap.e.]

In stands of *Picea jezoensis* and *Abies mayriana* on level ground in Hokkaido, a skidding pan drawn by a Fordson 42-h.p. tractor (1) proved more efficient than a rubber-tyred sulky drawn by a Japanese 52-h.p. CT-25 tractor (2), loads averaging 5 cu.m. for (1) and <2·5 for (2). The skidding pan proved more efficient than the sulky after heavy rain, when the wheels of the latter often sank in deep mud. In dry weather, ease of operation was in favour of the sulky.

4677. GORBAČEVSKIJ, V. A., and GAL′PERIN, Z. S. Novye avtomobili dlja vyvozki lesa. **[New lorries for wood transport.]** *Lesn. Prom.* 1959 (5), (8–11). [Russ.]

Lists and compares the specification of the JaAZ-214, MAZ-502, and ZIL-157 lorries, and describes in detail the outstanding features of each. The first model is equipped with a remote-controlled 3-drum winch which enables it to skid timber within a radius of 70 m. to the lorry and then to self-load with bundles of tree-length logs [cf. *F.A.* 20 No. 1889]. Full details are also given, with an illustration, of the design of the automatic tyre-inflation pressure-control system developed for the ZIL-157 lorry [cf. *F.A.* 20 No. 3255].

4678. LEONT′EVA, M. G. Vlijanie rejsovoj nagruzki na iznos detalej avtomobilja. **[The influence of the load carried per trip on the wear of lorry engines.]** *Lesn. Prom.* 1959 (5), (22). [Russ.]

Analyses data from several lespromkhozes on the service life of components (particularly of the piston assembly) of MAZ-200 lorries used for transporting wood (*a*) in trailers at 10 cu.m./trip, and (*b*) in trailer-trains at 50 cu.m./trip. The analysis is based (1) on kilometres travelled, and (2) on cu.m./km. done. Results are graphed.

4679. **Report on truck problem survey.** *Woodl. Sect. Index Canad. Pulp Pap. Ass.* No. 1825 (*B*-8-*e*), 1958. pp. 6.

Spare parts costing $4 million were required for ca. 7000 vehicles in 1957. A survey of problems encountered showed that points for improvement were: to increase ground clearance, reduce vibration, improve brakes, strengthen lorry frame-members, and provide automatic alarms to indicate dangerous temperatures and pressures.

4680. SMITH, J. T. **Pulpwood and truck-hauling—methods and costs.** *Pulp Paper Mag. Can.* 60 (4), 1959 (164 . . . 186, 192).

A detailed analysis of the methods and costs of pulpwood transport by lorry (average haul ca. 45 miles) on the island of Anticosti, in the Gulf of St. Lawrence, since 1950. Using 7-ton Ford lorries + semi-trailers, the total cost per cunit-mile was reduced to $0.141 in 1956–58, a satisfactory figure but one that is still improvable.

4681. SJUNDJUKOV, H., and GERASIMOVA, K. Stroitel′no-remontnyj poezd. **[A train for laying and repairing [railway lines].]** *Lesn. Prom.* 1959 (4), (9–12). [Russ.]

Describes the SRP-2 train specially developed for laying, repairing and taking up temporary narrow-gauge railway lines used in forestry (>10,000 km. of such lines are laid and taken up annually in the U.S.S.R.). These operations have been relatively little mechanized hitherto, and savings of >200 man-days per km. were achieved.

4682. NOVIKOV, G. N. Organizacija lesozagotovok na baze železnyh dorog širokoj kolei. **[The organization of logging, based on broad-gauge railways.]** *Lesn. Prom.* 1959 (5), (3–8). [Russ.]

Discusses the work of large-scale logging enterprises based on broad-gauge (B.G.) railways in the W. and N. of the U.S.S.R. The planned development of the Siberian forests will demand a railway network to carry the timber to the centres of utilization, mainly in European Russia, while avoiding the already heavily loaded Trans-Siberian Railway. Logging based on a B.G. railway system is shown to be more efficient and economic than that based on a narrow-gauge system or on lorry roads, and the B.G. method is advocated for use in the opening-up of the Siberian forests.

4683. SHAW, R. G. **Helicopters in British forests.** *For. Prod. J.* 9 (2), 1959 (30*A*-31*A*). 1 ref.

The aircraft, an Augusta Bell 47 G with a pay-load of 600 lb. and a speed of 60 m.p.h., was tested in 1956 near Fort William, Scotland, in the extraction of second thinnings. It carried 3 tons/hour in 12 trips of 1500 yards each way, and managed poles up to 27 ft. long. At £25/hour the operation, though smooth and easy, was quite uneconomic.

4684. ROGERS, D. R. **New helicopters—the answer to a logger's prayers.** *Timber of Canada* 20 (4), 1959 (32–5).

A conservative costing of a hypothetical helicopter logging operation has been worked out in detail with the helicopter company's engineers, test pilots and salesmen and compared with actual logging expenditures under existing methods for the season 1957–58. The operation concerns 14 million bd.ft. of softwood logs, 0–7 miles from a floating stream (a lead applicable to 85% of the 1500 sq. miles involved). There is a saving of $9.27/1000 bd.ft. for helicopter logging but, to lift these logs, only 1300 of the possible 1800 to 2000 hours would be used. If 1600 hours were flown to lift 17 million bd.ft. (with a better spread of annual depreciation, insurance, overhaul, maintenance, and the 2 pilots' salaries) the saving would rise to $13.00/1000 bd.ft. For helicopter logging the break-even point is stated to be passed when the pay-load reaches 8000–9000 lb., a figure within the capacity of the Vertol Aircraft Corporation's new 107 twin-jet model, the performance of which was used in the study. A committee of the Canadian Lumberman's Association is checking the figures of this study.

378. Water Transport

See also Nos. 5035, 5059.

4685. CZARNECKI, J. Transport wodny drewna (ważniejsze pojęcia, urządzenia i metody pracy). **[Water transport of wood—basic concepts, equipment and methods of work.]** *Sylwan* 103 (1), 1959 (25–47). 9 refs. [Pol.]

A review, covering: the different types of floating; equipment at floating depots; methods of binding the wood for floating in booms, bundles and rafts; categories of water for floating; dealing with sinkers; and transport in boats and ships.

4686. RASSUDOV, B. A. Ob usoveršenstvovanii splotočnyh mašin lebedočno-trosovogo tipa. **[The improvement of winch-and-cable-type bundling machines.]** *Lesn. Prom.* 1959 (3), (8–10). [Russ.]

Describes the principles and relative advantages of 5 bundle-binding machines used or suggested for use in the U.S.S.R.

4687. GECOW, R. Zbijanie tratew gotowymi elementami. **[Raft assembly with ready-made connectors.]** *Prace Inst. bad. Leśn.* No. 186, 1958 (49–63). [Pol.russ.e.]

A full description, with engineering drawings, of the connectors [cf. *F.A.* 18 No. 4146], and a comparison with conventional methods of raft assembly and dismantling, showing the savings possible in time and materials.

4688. MOROZOV, S., and RAHMATULLIN, M. Pervyj opyt splotki sigar na l'du ozera Bajkal. **[First attempt at making cigar-shaped rafts on the ice of Lake Baikal.]** *Lesn. Prom.* 1959 (3), (13–6). [Russ.]

Describes in detail the construction of the rafts in frames on the ice. In order to strengthen the ice, for each raft nine pairs of vertical posts were driven through to the lake bottom (ca. 4 m. deep) and frozen fast. Cross-bars were then fastened on them to help take the weight of the rafts (each ca. 500 cu.m., 52 m. long, 7·5 m. max. width, 3·4 m. total height, 2·5 m. draught). This method of raft assembly in winter was found to be cheaper than conventional assembly in spring and summer.

4689. GONIK, A. A. Buksirovka plotov po porožistym učastkam bez tormoznogo takelaža. **[Towing rafts without braking gear in stretches of river with rapids.]** *Lesn. Prom.* 1959 (3), (21–3). [Russ.]

Presents calculations of the speeds and behaviour of towed rafts of different lengths (with no breaking gear) in rapids (3 and 4 m./sec.) and in the stiller water (1 m./sec.) below them, with a view to determining the maximum length of raft that still avoids the danger of the stern swinging round. This maximum length for conditions on the Angara river seems to be ca. 300 m., and comparison showed that it was more economical to tow such 300-m.-long rafts (3500 cu.m.) without braking gear, than 700-m. ones (7500 cu.m.) with braking gear.

4690. ŠABOLKIN, L. M. Takelaž povyšennoj deržaščej sily dlja rečnyh plotov. **[Tackle with increased holding power for river rafts.]** *Lesn. Prom.* 1959 (3), (23–5). [Russ.]

Describes the use of four 800-kg. Matrosov anchors [not further described] which have greater holding power than conventional ones, for halting, and two 150-kg. Matrosov anchors plus two 1600-kg. weights for slowing down, a 30,544-cu.m. trial raft on a tow of 345 km. This equipment represented a large saving in metal; it is estimated that 50 tons of steel cable will be saved per million cu.m. of timber towed.

4691. NEVSKIJ, E. G. Mehanizacija takelažnyh rabot. **[Mechanization of work involving wire cables.]** *Lesn. Prom.* 1959 (2), (12–4). [Russ.]

Describes, with engineering drawings and specifications, electrically powered machinery developed by the Volga-Kama Timber Floating Branch for easing work with steel cables, viz. the VKF-NS-5 machine for winding large (e.g. 21-mm.) diameter cables into coils, and the VKF-VN-2 machine for straightening, joining and coiling used wire ropes (6–8 mm. diam.).

4692. MOKRUŠIN, M. S., and KOREPANOV, V. M. Barabannye uskoriteli na Tavdinskom lesokombinate. **[Drum-type log-movers at the Tavdin Forest Combine.]** *Lesn. Prom.* 1959 (3), (11–2). [Russ.]

Describes a pontoon-based machine which can be used for (*a*) moving or (*b*) sorting the logs in a floating depot. It consists basically of an electrically driven peg-drum: for (*a*), 800 mm. long, 500 mm. diam., speed 57 rev./min., and with 140 pegs;

for (*b*), 2000 mm. long, 267 mm. diam., 103 rev./min., and with 280 pegs.

4693. ŽUČIN, V. Gidravličeskie uskoriteli na rejdovyh rabotah. **[Hydraulic current-makers for work in floating depots.]** *Lesn. Prom.* 1959 (5), (23–4). [Russ.]

Owing to peculiar local conditions, at certain seasons the current of the Kubena river, on which the Vysokovski floating depot is located, falls practically to zero. Accordingly, in 1958, cable-type VKF and hydraulic GU-10 current-makers were used at the depot. This made possible a reduction in the labour force from 112 to 74 men, a 1·5-fold increase in productivity, an increase in the depot's daily output from 7000 to 9000 cu.m. and a reduction in costs of Roubles 0.171 per cu.m. of wood handled. The specifications are given of the GU-10 current-maker, which is powered by a 10-KW electric motor. Its rated effective range is 170–210 m., but in actual practice, the maximum was 120 m. The distance up to which an effective ($\nless$0·2 m./sec.) current was produced was 90–95 m. The area of the current-maker's action is graphed: the current produced decreased from 0·5 m./sec. near the installation to 0·1 m./sec. at a distance of 120 m.

4694. SMOLJAR, A. A. Mehanizacija razdelki hlystov na rejdah priplava. **[Mechanized cross-cutting of tree-length logs [on the water] in floating depots.]** *Lesn. Prom.* 1959 (4), (19–20). [Russ.]

Three circular saws are mounted on a pontoon, and tree-length logs (up to 25 m. long and 55 cm. butt diam.) released from bundles further upstream are drawn along by boathooks to a feed roller with curved grips. This roller lifts the floating log to the cross-cutting saws, the assortments then falling back into the water and being carried away by the current. One log takes 15–18 sec. to cross-cut. Details of the depot lay-out, productivity and costs are given.

4695. NAZAROV, V. N. Zatopljaemyj gruzovoj pričal. **[A loading-mooring which may be submerged.]** *Lesn. Prom.* 1959 (3), (27–8). [Russ.]

A mooring is described and illustrated that can be used at any time, despite the fluctuating water-level (4–6 m.) of most of the rivers in the Urals and Siberia. A narrow-gauge railway line is laid down the bank to the lowest water level and fixed permanently, a pontoon-mounted crane being moored there to unload or load the vessels. A winch high up on the bank moves wagons up or down the railway line to the pontoon, which can also be pulled up or let down according to the level of the river.

4696. DUFF, C. H. **Compressed air as a means of keeping a lake dump open during the freeze-up.** *Pulp Paper Mag. Can.* 60 (4), 1959 (208 . . . 214).

Explains the theory of the method, and describes the equipment, method and results of an air-bubbling system used at Washeka Bay for an area of 900 × 1100 ft., 20–60 ft. deep. [Cf. *F.A.* 18 No. 2938; 19 Nos. 3088–9.]

4697. SILVERSIDES, C. R. **The application of recent studies on ice to logging operations in Eastern Canada.** *Pulp Paper Mag. Can.* 60 (5), 1959 (169 . . . 175, 184). 10 refs.

Relates the various findings on freeze-up, ice formation, ice texture, expansion and contraction of lake ice, air holes, prediction of ice thickness, bearing strength of ice, ice quality, effect of foreign matter, and break-up, to logging operations.

38. Forest Engineering

382. Buildings (Logging Camps etc.)

4698. HUDSON, D. W. **The evolution and construction of the 'Green River' camp.** *Pulp Paper Mag. Can.* 60 (3), 1959 (129 . . . 153).

Describes the evolution in design and materials of camp buildings, which has culminated in Quonset [Nissen-hut-type] buildings made in small, prefabricated sections which can be easily transported and assembled. The buildings are described in detail, and the materials required for them listed.

383. Roads and Bridges

See also Nos. 4108, 4697.

4699. VOLKERT, E. Vom Wesen der Bodenstabilisierung. **[Soil stabilization.]** *Forst- u. Holzw.* 14 (7), 1959 (150–5). 12 refs. [G.]

Explains the forces acting on and within the road surfacing material, the importance of layer depth and particle sizes of the material used, the best mixtures for practical use, and the importance of soil moisture content and of the compacting machine in attaining the optimum layer depth in forest road-making.

4700. BRAND, W., and PRIEMER, G. Die Bodenstabilisierung mit Kalk als Bauelement im Wald- und Wirtschaftswegebau. **[Soil stabilization with lime, as a method in forest and farm road-building.]** *Forst- u. Holzw.* 14 (7), 1959 (155–8). 5 refs.

The method involves mixing lime with the soil, and compacting the mixture at a certain optimum moisture content. This can (*a*) change the soil structure, or (*b*) bring about a hydraulic strengthening of the soil. The best kinds of lime, the equipment and method, and the scope of use are discussed. Various surfaces, e.g. bitumen, can be applied after the stabilization. In 1958, it cost 2·5–3·5 DM./sq.m. to stabilize a 15-cm. layer with lime, and in that year >100,000 sq.m. of soil were so stabilized in Germany.

4701. Bau und Instandhaltung stabilisierter Waldwege. **[Construction and maintenance of stabilized forest roads.]** *Allg. Forstzeitschr.* 14 (24), 1959 (421–48 + 2 plates). 30 refs. [G.]

A special number, with many illustrations, including articles on: Soil stabilization with cement (*A. Althammer*) [discussing equipment, suitable soils, quantities of cement required etc., and describing a road built over marshy ground in Bavaria, which was reasonable in cost and has withstood very bad weather conditions]; Experience with stabilized roads in Heilbronn district (*E. Gleichmann*) [describing experimental roads over heavy, frequently waterlogged soils, using mechanical stabilization, and stabilization with lime (with or without sand), tar (cold or hot with or without previous use of lime), cement, etc.]; Maintenance of stabilized surfaces (*G. Greiss*) [covering hand and machine work]; and Compacting techniques (*E. Volkert*) [including relation of equipment to soil and moisture conditions].

4702. Pätzhold, H. Die Bodenstabilisierung mit Teerbindemitteln im Waldwegebau. **[Soil stabilization with tar binders in forest roadbuilding.]** *Forst- u. Holzw.* 14 (7), 1959 (159–61). [G.]

A general account of principles, methods, materials and equipment [no costs given].

4703. Wagner, K. Stabilisierungsverfahren im Waldwegebau mit Bitumenemulsionen. **[Methods of stabilization with bitumen emulsions in forest roadbuilding.]** *Forst- u. Holzw.* 14 (7), 1959 (162–4). [G.]

A general account of principles, methods, materials and equipment [no costs given].

4704. Hafner, F., and Hedenigg, W. Untersuchungen bezüglich der erforderlichen Abstände von Wasserkehren bei Forstwegen im Gebirge. **[Spacing of cross-drains on forest roads in the mountains.]** *Allg. Forstztg.* 70 (11/12), 1959 (138–40). 1 ref. [G.]

The article, based on inspections and measurements of 40 Austrian roads, includes illustrations of good and bad drainage, and a table of recommended distances for permanent channels in gravel roads at least 3 years old, according to gradient and general conditions of precipitation etc. [Cf. *F.A.* 20 Nos. 1908, 3271.]

384. Protective Works, including Torrent Training

See also Nos. 4096, 4109–11, 4523.

4705. Commission européenne des forêts: Groupe de travail de la correction des torrents et de la lutte contre les avalanches. Bibliographie 1957. **[European Forestry Commission: Working party on torrent control and avalanche protection. Bibliography 1957.]** [*Docum.*] *FAO European For. Comm. Wkg. Party on Torrent Control* No. *FAO/EFC/TORR* 20, 1958. pp. 46. [F.] Limited distribution.

Covers publications in Germany, Austria, Italy, Rumania and Jugoslavia before 1957, and for those countries and Switzerland and Turkey in 1957.

4706. Schwarz, W. Düsendächer, Pultdächer, und Treibschneewände. **[Boarding to funnel, deflect, and check drifting snow.]** *Schweiz. Z. Forstw.* 110 (2), 1959 (89–95). 8 refs. [G.]

Describes various arrangements of barriers (wooden boards, aluminium sheets etc.) on ridges, supported at 20–40° to the horizontal and ca. 1·2 m. from the ground at the leeward edge, as a funnel to increase wind velocity and so prevent overhanging snowdrifts; inclined so as to form extensions of the windward slope; or as upright barriers. It is hoped, *inter alia*, that these installations will allow scattered groups of trees to close up and form a natural barrier.

385. Drainage, Irrigation, Sedimentation. Water Supply

See Nos. 4536–9.

4. FOREST INJURIES AND PROTECTION

41. General Technique of Forest Protection. Types of Injury

4707. Martin, H. **The scientific principles of crop protection.** Edward Arnold Ltd., London. 4th ed. (rev.) 1959. pp. viii + 359. Many refs. Price 65*s*.

The present edition follows the plan of the third edition (1940) [cf. *F.A.* 2 p. 258], except that the general principles and mechanisms of toxic action now receive coordinated treatment before the discussion of their specific application to the several groups of pesticides.

4708. Wallis, G. W. **Effects of biocides on the growth of seedlings of Monterey Pine, Black Locust and European Alder, and the development of their symbiotrophic organs.** *For. Res. Note Wis. Coll. Agric.* No. 45, 1959. pp. 2.

This study was concerned with the effect of commonly used poisons (chlordane, thiosan, allyl alcohol, aldrin and dieldrin) on mycorrhizal fungi associated with *Pinus radiata*, bacteria of the *Rhizobium* group associated with *Robinia pseudoacacia*, and *Actinomyces alni* symbiotizing with *Alnus glutinosa*. The chemicals were applied to insulated sand cultures (*a*) at the generally recommended rates and (*b*) at rates greatly in excess of normal applications. The seedlings were examined after 5 months, when it was found that (*a*) treatments had produced no statistically significant effects on growth of plants, development of microbiotic roots, or uptake of N; (*b*) treatments, especially of aldrin and of chlordane + thiosan + allyl alcohol, significantly reduced dry-matter production, uptake of N, and the number of symbiotrophic organs. *A. glutinosa* proved to be most, and *P. radiata* least vulnerable to injury by the poisons. The presence of dieldrin at ca. 5 lb./acre stimulated rather than depressed the growth of seedlings, particularly their crowns. This effect appears to be definitely harmful, as it leads to the production of unbalanced and succulent planting stock vulnerable to drought and frost.

42. Injuries from Inorganic Agencies other than Fire

422. Temperature Influences. Frost. Heat. Drought

See also Nos. 4143, 4299, 4409–11, 4472, 4495, 4795, 4953, 4959, 4962, 5306.

4709. Horvat, S. Kleiner Beitrag zur Frage des Frostschutzes durch chemische Mittel. **[Frost**

protection by chemicals.] *Schweiz. Z. Forstw.* 110 (4), 1959 (272–3). [G.]

[Cf. *F.A.* 20 No. 4472.] One half of 60 four-year-old potted Beech wildings were sprayed with a 0·5% borax solution after they had flushed, and were then exposed, with controls from the other half, to sharp frosts for 120–180 minutes. At $\geqslant -5{\cdot}5^\circ$ C. injuries on all plants were slight. At $\leqslant -8^\circ$ all shoots were killed. At the critical temperatures in between, treatment appeared to have some effect; at 6°, 29% of shoots on the treated plants were killed compared with 58% on controls.

4710. Lenoir, R. Les dégâts causés par l'hiver 1956 aux arbres et arbustes exotiques installés à Rendeux (Basse Ardenne). **[Injuries caused by the winter of 1956 to the exotic trees and shrubs grown at Rendeux (Basse Ardenne).]** *Bull. Soc. for. Belg.* 66 (3), 1959 (191–209). 4 refs. [F.]

Describes its effects on >100 conifers and >200 broadleaved trees or shrubs, and gives data on temperature extremes etc.

4711. Tucović, A. Uticaj niskih temperatura na alohtonu dendrofloru Beograda i okoline u toku zime 1955/56 godine. **[The influence of low temperatures on the exotic trees in and around Belgrade during the 1955–56 winter.]** *Zašt. Bilja* No. 39/40, 1957 (42–55 + 3 plates). 11 refs. [Serb.e.] I.M.I.

Lists the degree of damage (if any) sustained by 196 exotic species during February 1956, which had a mean minimum temperature of −10·4° C. and an absolute minimum of −20·5°.

4712. Godman, R. M. **Winter sunscald of Yellow Birch.** *J. For.* 57 (5), 1959 (368–9). 5 refs.

Describes a case in Michigan. The injury is believed to be caused by rapid re-freezing of the tissues after they have been unseasonably warmed by the sun. In this case, on 16 Feb., 1948, the air temperature rose rapidly from below freezing to 51·1° F. by 3.30 p.m. and then dropped sharply to below freezing. The injury is rare on Yellow Birch in these latitudes, but may increase as more thinnings and other stand improvement work are done. Recommendations on protection and leaving screen trees (cf. Huberman, *F.A.* 5 p. 273] are made.

4713. Hudson, R. K. **The influence of microclimate on the establishment and early survival of planted Red Pine, *Pinus resinosa* Ait., in southwestern Michigan.** *Abstr. of thesis*, in *Dissert. Abstr.* 19 (7), 1959 (1498). O.R.S.

Results of a study at the Kellogg Forest showed a significantly higher mortality during the first 2 growing seasons, of trees planted out on a S-facing slope in spring 1954 than of those on a N.W.-facing slope. The summers of 1954 and 1955 were among the hottest and driest recorded, and death of all trees was attributed to drought.

4714. Salisbury, P. J., and Long, J. R. **High temperature damage to Douglas Fir seedlings.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 15 (2), 1959 (3).

Losses of seedlings during a particularly hot dry summer in British Columbia were unusually heavy. It was found that heat damage was greatest in the youngest seedlings and greater on plots mulched with dark coloured sawdust than on those with ordinary light-coloured soil cover. Temperatures at the surface of sawdust cover in full sunlight were 15–20° higher than at surface of soil cover in full sunlight.

4715. Cantiani, M. Osservazioni sugli effetti della siccità estiva nelle faggete dell' Irpinia. **[The effects of summer drought on the Beech stands of the Alta Irpinia.]** *Ital. for. mont.* 13 (6), 1958 (251–6 + 8 photos). [It.it.f.]

A prolonged drought in the summer of 1958 caused premature autumn coloration and leaf-fall in August, especially in stands that had been subjected to regeneration fellings, and on aspects most exposed to the sun. Dense, young stands were less affected.

423. Precipitations

See also Nos. 4356, 4358.

4716. Inoue, Y., and Kakihara, M. **[Studies on the snow-damaged forest in Kasuya University Forest.]** *Rep. Kyushu Univ. For.* No. 9, 1958 (1–27). [Jap.e.]

Analyses the damage done by an exceptional snowstorm (30 cm. fall vs. the previous recorded maximum of only 8 cm.) in Feb. 1956. Damage on the S. and E. slopes was greater than elsewhere. Damage among Japanese Cedar [*Cryptomeria japonica*] was greater on gentle than on steep slopes, and in 16-year stands greater on the lower slopes than on the upper. *C. japonica* and Pencil Cedar [*Juniperus virginiana*] were more heavily damaged than other species, with a higher incidence in the younger stands; but the thickest and tallest trees suffered most top-breakage. The height above ground of the point of breakage rose with age of tree. Damage increased with stand density, showing the need for suitable thinning. Volume and number of trees damaged are tabulated by species.

424. Soil Conditions. Erosion Effects. Nutrient Deficiencies etc.

See Nos. 4084, 4257–8, 4295, 4450, 4540, 4610, 4962.

425. Chemical Influences (Atmospheric)

See also Nos. 4084, 4540.

4717. Lines, R. **Atmospheric pollution and its influence on British forests.** *Coedwigwr* 3 (3), 1958/1959 (98–104). 23 refs.

A review of literature.

4718. Matějů, K. Dosavadní odhady škod způsobených kouřovými plyny v české oblasti Krušných hor a plán jejich systematického zjišťování a sledovani. **[Assessment to date of smoke damage in the Bohemian districts of the Erzgebirge, and a plan for its systematic evaluation and investigation.]** Lesprojekt, Ústav pro Hospodářskou Úpravu Lesů, Brandýs nad Labem. 1957. pp. 35 + 3 maps, 3 tbls., 3 gphs., 2 dgms. [Cz.]

A report compiled for a conference on smoke damage held at Teplice, Czechoslovakia, 24–26

Oct. 1957. It contains sections on: an analysis of natural conditions and the present state of the forests; evidence of damage; assessment to date of smoke damage; systematic study of vegetation types and forest protection as the basis for forest management and scientific research; planned forest management; and co-ordination work.

426. Electrical and Cosmic Influences

See No. 5309.

43. Forest Fires

4719. Davis, K. P. **Forest fire, control and use.** McGraw-Hill Book Company Inc., New York, Toronto, London. 1959. pp. ix + 584. 23 pp. of refs. Price £4 13*s*.

A textbook based largely on U.S. research and experience, supplemented from Canadian sources, covering in Part 1, effects and behaviour, in Part 2, control, and in Part 3, fire in forest land management. The N. American bibliography is classified by subject.

4720. Rivard, J. F. **Directory of forest fire protection information.** *Woodl. Sect. Index Canad. Pulp Pap. Ass.* No. 1862 (*F*-3), 1959. pp. 44.

Lists many books, publications of the Canadian Pulp and Paper Association, articles in *Woodlands Review*, *For. Chron.*, and *J. For.*, miscellaneous publications, and Canadian and U.S. Government publications. Also lists particulars of 112 films on fire protection training, with a description of each.

431. Predisposing Factors and Causes. Fire Danger. Fire Behaviour

4721. **Totalizing wind counter for contact-type anemometers.** *Fire Control Notes* 20 (1), 1959 (7–10).

Describes a unit designed by the U.S. Forest Service, making use of a simple electrical circuit which is dependable and inexpensive (estimated total cost ca. $15.00). The use of an automatic counter eliminates some of the human error involved in observations at fire-weather stations.

4722. Countryman, C. M., and Colson, D. **Local wind patterns in Wildcat Canyon.** *Tech. Pap. Calif. For. Range Exp. Sta.* No. 28, 1958. pp. 12.

Analyses of wind conditions in July-Sept. 1954 in a small canyon in California indicated that local conditions frequently exerted a major control on local wind patterns and only strong upper-air patterns extended their influence to the surface. Local data are therefore essential for accurate fire-weather and fire-behaviour prediction. By sampling distinctive topographic types, however, major wind-behaviour problems may be identified and laboratory studies with topographic models can be used to determine the basic relationships creating and controlling local wind patterns.

4723. Nelson, R. M. **Drought estimation in Southern forest fire control.** *Sta. Pap. Stheast. For. Exp. Sta.* No. 99, 1959. pp. 22. 28 refs.

Discusses literature on water balance and soil moisture in the southern U.S.A., and presents a table of the evapo-transpiration to be expected for a series of mean daily temperatures. With the help of this and other simplifying assumptions (a mean field capacity of 12 in., a uniform depletion rate etc.) soil moisture depletion curves can be worked out that agree fairly well with recorded data [cf. *F.A.* 17 No. 1172].

4724. LaMois, L. **Fire fuels in Red Pine plantations.** *Sta. Pap. Lake St. For. Exp. Sta.* No. 68, 1958. pp. 19. 15 refs.

Grass and herbaceous cover and needle and branch litter were sampled in the Lake States in 75 Red Pine plantations of different spacing, age and site quality. Good sites and close spacing both promote the rapid build-up of litter and dead branches as fuel, but they also bring about early crown closure, which suppresses fire danger from grass fuels. The approximate relationship of fuel weights to age, spacing and growth rate of plantations is shown graphically.

4725. Cramer, O. P. **Using fire-weather forecasts and local weather observations in predicting burning index for individual fire-danger stations.** *Res. Pap. Pacif. Nthwest. For. Range Exp. Sta.* No. 28, 1958. pp. 33. 2 refs.

A pilot test of fire-danger forecasting aids, i.e. using tabular and graphic aids for converting area forecasts and local observations of relative humidity and wind speed [cf. *F.A.* 19 No. 1878] into predicted values for individual fire-danger stations, was made in 5 ranger districts in Oregon and Washington during the 1950 and 1951 fire seasons. The preparation of forecasting aids by regular personnel at ranger stations was generally inadequate, owing to misunderstanding of the principles and misinterpretation of the instructions; but in all districts where they were intensively used, the correctly completed aids were found quite helpful and simple to use, and with them it took ca. 2 min. to predict the burning index (B.I.), which is based on wind speed and moisture content of fuel-moisture indicator sticks in the critical mid-afternoon period. Greatest obstacles to construction and application of the aids were inaccurate forecasts and the complexities of conditions round the station. Accuracy varied greatly between stations and from year to year; it was determined for all days and separately for days on which a particular weather factor was considered unusually important. Although none of the methods tested was reliable for all stations, average accuracy of the most promising procedures was slightly higher than that achieved by the old method of assuming that tomorrow's B.I. would be the same as today's.

432. Prevention and Control

4726. Bennett, W. D. **The reduction of forest fire hazards introduced by mechanical equipment.** *Woodl. Res. Index Pulp Pap. Res. Inst. Can.* No. 111, 1959. pp. 25. 40 refs.

Discusses the scarcity of information and statistics on fires caused by equipment, and examines the fire risks presented by power saws, tractors and powered equipment, railway locomotives, and camp equipment such as cookers, welding outfits, etc. It is concluded that mechanical equipment does not present a very serious risk, but that of all mechanical equipment in use, the power saw constitutes the greatest. Recommendations are made to reduce such risks.

4727. **Fire weather: Cloud nucleation for lightning prevention.** *For. Fire Rep. Calif. Div. For. 1958*, [1959] (7–10).

Further experiments in modifying cumulus-cloud build-up by the use of ground generators are described. Results showed some apparent increase in cloud-to-ground lightning and in number of forest fires on the days when seeding was carried out, compared with similar days when it was not. [Cf. *F.A.* 20 Nos. 1938–9.]

4728. MORGAN, E. **The fire-fighting camera.** *Forests & People, Alexandria, La.* 9 (1), 1959 (15, 41).

A rapid visual means of communication between the aircraft patrolling a forest fire and the fire-control headquarters on the ground has been a long-felt need. With the development of the Polaroid camera and its one-minute print, the first step was made. What was then needed was to build a camera that could use the Polaroid back, fit into the floor of a light aeroplane, be operated by the pilot with one hand, and produce a clear, sharp, gridded print. The Louisiana Forestry Commission has now developed such a camera (described, with specification) and is using it, installed in a Cessna 180.

4729. FAHNESTOCK, G. R. **Borate firelines toxic to Southern vegetation.** *Sth. For. Note Sth. For. Exp. Sta.* No. 118, 1958 [2–3].

Tests in Central Louisiana indicated that constructing effective fire-lines in southern fuels by spraying from the ground required 5 to 15 gal. of slurry containing 3 to 5 lb. of sodium calcium borate per 100 sq. ft., and that these quantities were harmful to vegetation. Longleaf, Loblolly and Slash Pines, 6–10 ft. high, sprayed in December with 1 or 2 gal./tree, lost an abnormal amount of foliage and looked very unhealthy the following autumn. Mortality of Loblolly planted in Jan. after December spraying was 95% compared with 5% on adjacent unsprayed strips, where, however, 88% of the plants showed borate injury. Germination of Slash Pine sown in March after December spraying was nil, and on adjacent strips much reduced. Most brush and herb vegetation was also killed or injured.

4730. MCKINTY, J. A. **The use of explosives as a practical means of disposing of snags in fire-fighting operations.** *Aust. For.* 22 (1), 1958 (30–5).

Various techniques have been tested in Victoria in the use of explosives to dispose of standing dead trees when making firebreaks on the flanks or in front of a going fire. Practical notes are given on application of the charge, tools used, the type of charge etc.

435. Benefits of Fire Control. Injurious Effects of Fire

See also Nos. 4380, 4785.

4731. TRAPNELL, C. G. **Ecological results of woodland burning experiments in Northern Rhodesia.** *J. Ecol.* 47 (1), 1959 (129–68 + 3 plates). 2 refs.

[Cf. *F.A.* 20 No. 1950.] A detailed review of findings from 1933 to date. A complementary review for soils is being published.

436. Beneficial Effects of Fire. Uses of Fire in Silviculture and Other Forms of Husbandry

See also Nos. 4050, 4380–2, 4419, 4851.

4732. **Symposium on prescribed burning in forestry, agriculture and wildlife management.** *Publication, Newfoundland Research Committee, St. John's* No. 1, 1958. pp. 78 + 1 map, 1 gph., 2 photos. 11 refs.

Papers presented include: Studies of regeneration on burnt forest land in Newfoundland (*D. E. Nickerson*) and The Balsam woolly aphid and prescribed burning (*F. Frost*) [both referenced separately]; Notes on control burning (*J. C. MacLeod*); Possible use of men and equipment of forest protection organization on prescribed burning (*F. R. Hayward*); The ecological effects of fire and its possible application to game management (*S. S. Peters*); Prescribed burning and the growing of blueberries (*A. C. Badcock*); Blueberry burning and botanical relationship (*E. L. Eaton*); and Changes in the soil following burning (*H. W. R. Chancey*) [severe fires causing, by loss of organic matter, compaction and development of poorly drained wet, treeless soils under the conditions of the Province].

4733. **Controlled burning effects on several cover types.** *Rep. Lake St. For. Exp. Sta. 1958*, 1959 (32).

Five burns in spring and 3 in autumn in N. Minnesota indicated that a light surface burn not only killed the aerial parts of all the brush (primarily Hazel and Dogwood) but also many hardwood saplings of the Aspen and Birch cover types of the 1- and 2-in. diam. classes. Larger hardwoods were also killed by a greater fire intensity. Spring burning in all cases was followed by coppicing and suckering, so that in many places the number of brush stems now exceeds that of the original stand. Where slash was also present, however, the new shoots are less numerous than before burning and less vigorous than those where the fire was less intense.

4734. WEAVER, H. **Effects of burning on range and forage values in the Ponderosa Pine forest.** *Proc. Soc. Amer. For.* 1958 (1959), (212–5). 27 refs.

Discusses evidence, much of it historical, to support the author's view of the ecological role of fire in these forests and his suggestion that prescribed burning would benefit both the tree and the grass crop [cf. *F.A.* 20 No. 2956].

4735. EVERTS, A. B. **Slipon tanker-flamethrower.** *Fire Control Notes* 20 (1), 1959 (3–6).

Describes a tanker-flamethrower, designed for burning piles of slash, and using both propane gas (for ignition) and diesel oil (for burning heavy material). It can quickly be converted to a slip-on water tank by removing the propane-gas tank and vaporizing cylinder.

44. Damage by Harmful Plants. Virus Diseases

441. Weeds

See also Nos. 4144–5, 4462–6, 4486, 4530, 4534–5, 4540, 4548, 4570–8, 4628, 4708.

4736. McCreath, J. B., Broadfoot, A., and Forrest, J. D. **Bracken cutting trials (fourth year) 1955.** *Report, West of Scotland Agricultural College, Glasgow* No. 29, 1955. pp. 9. From *abstr.* in *Weed Abstr.* 7 (11), 1958 (1987). O.R.E.

Double cutting for 4 years has reduced *Pteridium aquilinum* height from 20–28 to 5–10 in. and density from 18–36 to 5–10 fronds/sq.yd. The reduction in density was most noticeable in the last 2 years. As the height of the bracken decreased the % of missed fronds increased, the critical height for the machine being 6–8 in. The machines used were Holt Breaker, Cuthbertson Crusher, Henderson Slasher, and Ferguson Mower. Ploughing and resowing (to grass) was seen to be the best control method, where possible. [Cf. *F.A.* 20 No. 1953.]

4737. Braid, K. W. **Bracken eradication.** *Transactions of the Royal Highland and Agricultural Society of Scotland, Edinburgh* (*Ser.* 6) 2, 1958 (16–23). 16 refs. From *abstr.* in *Weed Abstr.* 8 (3), 1959 (482). O.R.E.

Reviews the control of bracken [*Pteridium aquilinum*] by ploughing, rotovating, cutting, bruising, chemicals, trampling, flooding, burning, fungi and insects, and briefly discusses the effect of liming and fertilizers, of planting trees, and of utilization. The author considers ploughing or cutting to be the only really successful methods of control. Liming appears actually to stimulate the growth of bracken.

4738. Bougard, M. La lutte contre la fougère-aigle (*Pteris aquilina*). **[The control of bracken (*Pteridium aquilinum*).]** *Bull. Soc. for. Belg.* 64 (5), 1957 (237–40). [F.]

Gives some account of experiments made on some dozens of hectares infested with bracken on the Domaine de Baudour et de Beloeil in 1955. The preparation used, 'ST 412' [4-CPA?], was applied as a spray—100 litres in 1000 litres of water per ha. It is necessary to wet the whole of the aerial parts of the bracken (both faces of the fronds), and the success of the treatment depends on the most careful application. The best time for this is just as the fronds have completed their development; this varies with place and weather, but is generally between the end of August and the end of September. The cost of treating one ha. of bracken, including labour costs, was Belg. Fr. 4000–5000. 'ST 412' acts exclusively by translocation and destroys the rhizomes and subterranean buds as well as the aerial parts. It is equally destructive of most dicotyledons, but grasses (except very young plants) are very resistant. More than 80% mortality of bracken can be expected, and the feeble regrowth in the following spring can easily be destroyed by cutting back.

4739. Patric, J. H. **Sulfur dioxide as a defoliant of chaparral plants.** *J. For.* 57 (6), 1959 (437–8). 3 refs.

[Cf. *F.A.* 19 No. 3787.] Tabulates the results (% leaves killed, damage to other organs, and recovery) of defoliation trials with SO_2 on shrubs and small trees, made to investigate the possibility of reducing water loss from transpiration on chaparral watersheds in S. California, without increasing the danger of erosion.

4740. **New pesticides for 1959.** *Agricultural Chemicals, Baltimore* 13 (12), 1958 (34–6, 109–10, 119). From *abstr.* in *Weed Abstr.* 8 (2), 1959 (334). O.R.E.

Includes information on Dow Inverton 245, an invert emulsion of 2,4,5-T. Information is also given on Mylone Soil Fumigant, a new Crag formulation of 3,5,-dimethyltetrahydro-1,3,5,2H thiadiazine-2-thione, and on Tryben 200 (dimethylamine salts of 2,3,6-TBA 24·8% and of other polychlorobenzoic acids 1·3%) manufactured by E.I. du Pont de Nemours. It is claimed that 2 gal. of Tryben in 100 gal. water is effective against certain woody brush spp. including conifers, *Rosa* spp. *Rhus vernix*, *Diospyros virginiana*, *Sassafras albidum* and *Celtis occidentalis*. For these, spraying of foliage, stems, and the ground beneath, is recommended.

4741. **Fenac (2,3,6-trichlorophenylacetic acid).** *Technical Service Data Sheet, American Chemical Paint Co., Ambler* No. *H*-73, 1958. pp. 16. O.R.E.

A report on 3 years' preliminary field testing. Fenac-S is a water-soluble formulation of Na 2,3,6-trichlorophenylacetate, containing wetting and sequestering agents. It shows surprising resistance to leaching in the soil. After dilution it is compatible with amine salts of 2,4-D, $NaClO_3$, borates, amitrol [amino-triazole], TCA-Na, dalapon-Na and other water-soluble herbicides. Fenac-WP is a wettable powder formulation of the amide on an invert carrier with surfactants to facilitate dispersion in water. Fenac has a long residual life in the soil and is effective for both pre- and post-emergence treatment. Deep-rooted perennials respond slowly, however, when application is made after growth has begun. It appears to be less dangerous than 2,4-D in respect of drift and volatility. Results are presented of tests with different species, including preliminary trials in brush control.

4742. Davenport, O. M., and Herron, J. W. **Christmas tree weed-grass control.** *Repr.* from *Kentucky Farm & Home Science* 3 (4), 1957 (68). O.R.E.

Experiments were made in July 1957 on a 2-year-old Scots Pine plantation with various rates of dalapon, amino-triazole, mineral spirits fortified with PCP, and maleic hydrazide. None of the materials gave satisfactory control except at concentrations injurious to the trees.

4743. McCurdy, E. V. **The effect of varying rates of TCA and dalapon on Ash trees when applied to a dense stand of crested wheat grass growing under**

these trees. *Abstr.* in *Res. Rep. West. Sect. nat. Weed Comm. Can.* 1957 (77). O.R.E.

TCA at 20, 40, 60, 80 and 100 lb./acre was applied in late June to areas under rows of *Fraxinus pennsylvanica* var. *lanceolata*. By early August all trees showed injury in proportion to the rate of application of the chemical. At 100 lb./acre the trees were completely defoliated. Dalapon at 15 lb./acre gave a good kill of grass, and injury to the trees was light. At 20 lb./acre however, Ash leaves showed quite severe yellowing and spotting.

4744. BEHRENS, R., and MORTON, H. L. **Activity of substituted phenoxy acids in Mesquite root inhibition tests**. *Abstr. Weed Soc. Amer.* 1958 (33). From *abstr.* in *Weed Abstr.* 7 (12), 1958 (2302). O.R.E.

The relative inhibitory activity of 4-chloro-, 2,4-dichloro-, 2,4,5-trichloro- and 2-methyl-4-chloro-ring substituted phenoxy compounds with acetic-, and propionic- and γ-butyric-acid side-chains was determined in tests with Mesquite root. The inhibitory action tended to increase with increasing C atoms in the side chain, assuming that the activity of the α-propionics was conferred by the (*d*)-isomer. An exception was 2,4,5-TB, a compound able to withstand β-oxidation.

4745. WALKER, L. C. **Brush control in the Georgia Piedmont**. *Journal of Range Management, Portland* 12 (1), 1959 (16–8). 6 refs. From *abstr.* in *Weed Abstr.* 8 (4), 1959 (647). O.R.E.

Trials with C^{14}-labelled 2,4,5-T on brush species showed that: (1) only a portion of the material applied to foliage is absorbed through the leaf cuticle; (2) most of this absorption takes place within 24 hours of application; (3) the various formulations appear to have widely divergent absorption rates, the amine being superior to both the acetone and the NH_4 salt. A good first-year kill of *Pueraria thunbergiana* has been obtained with 2,4-D, 2,4,5-T, or amino-triazole. Yearly or even half-yearly treatments are necessary for eradication.

4746. LEONARD, O. A. **Absorption and translocation of radioactive 2,4-D, 2,4,5-T and amino triazole in Poison Oak (*Rhus diversiloba*)**. *Abstr. Weed Soc. Amer.* 1958 (24). From *abstr.* in *Weed Abstr.* 7 (12), 1958 (2220). O.R.E.

Autoradiographs of leaves of *R. diversiloba* treated in May showed translocation of amino-triazole (ATA), 2,4-D and 2,4,5-T to the plant tips and to the bark below the treated leaves. In July treatments, 2,4-D and 2,4,5-T were confined to the treated leaves, while ATA was translocated as before. When applied to the bark in October, ATA entered and was translocated downwards, whereas only slight amounts of 2,4-D and 2,4,5-T entered the bark.

4747. ČUTURILO, S. Planinska kleka kao korov planinskih pašnjaka i ispitivanje mogućnosti njenog suzbijanja primenom herbicida. [***Juniperus nana* as a weed of mountain pastures, and experiments in control with herbicides.**] *Zašt. Bilja* No. 38, 1956 (33–41). 9 refs. [Serb.serb.e.] I.M.I.

Experiments in 1955 on ca. ¼ ha. on Stara Planina with 2,4-D and 2,4,5-T showed that 1–3% 2,4,5-T (40% active principle) gave the best control.

4748. LEONI, A. Esperimenti sul controllo e la lotta contro la vegetazione infestante nei rimboschimenti della brughiera lombarda. [**Experiments in the control of unwanted vegetation in connexion with the afforestation of the Lombard heaths.**] *Monti e Boschi* 10 (3), 1959 (122–35). [It.f.e.]

Deals mainly with the control of coppice regrowth of Chestnut and Robinia on land to be planted with conifers. Experiments have been carried out for 5 years by the Vita Mayer paper company. Chemical control (chiefly with Ammate) was generally satisfactory, but too expensive for the total eradication of Robinia. Complete ploughing is the surest, and relatively cheapest, method, but its application is limited to flat or only slightly sloping sites. On steeper slopes it is best to eliminate the hardwoods gradually by underplanting with shade-bearing conifers (e.g. *Picea abies*, *Pseudotsuga taxifolia* and *Pinus strobus*). The traditional method of repeated cutting back of coppice shoots is costly and ineffective.

4749. PRESCOTT, L. H., and FRANCISCO, D. C. **Field investigations of the use of various herbicides on TVA rights-of-way**. *Abstr. Weed Soc. Amer.* 1958 (19–20). From *abstr.* in *Weed Abstr.* 7 (12), 1958 (2225). O.R.E.

The propylene glycol butyl ether and butoxy ethanol esters and the 20% amine salts of 2,4-D and 2,4,5-T were more effective against brush than the iso-octyl ester, when water was used as a carrier; there was little difference when using diesel oil. Conflicting results were given by NH_4 sulphamate. Amino-triazole gave 48% control of Black Locust.

4750. PRESCOTT, L. H., and MANN, R. A. **Trichlorobenzoic acid small-plot tests on TVA rights-of-way**. *Proc. 11th ann. Sth. Weed Conf.* 1958 (83–5). From *abstr.* in *Weed Abstr.* 7 (11), 1958 (1931). O.R.E.

Foliage applications of an aqueous solution of 2,3,6-TCB (Na) 1 lb./100 gal. gave 90% root kill of *Robinia pseudoacacia*; higher rates and an emulsifiable oil formulation were less effective, as was NH_4 sulphamate 60 lb./100 gal. Neither formulation appears to be effective as a foliage spray on *Quercus* spp. or *Carya* spp. *Campsis radicans* in the understorey was killed.

4751. PRESCOTT, L. H., and MANN, R. A. **Trichlorobenzoic acid small-plot tests on TVA rights-of-way**. *Abstr. Weed Soc. Amer.* 1958 (21). From *abstr.* in *Weed Abstr.* 7 (12), 1958 (2227). O.R.E.

2,3,6-TCB (Na) 1 lb./100 gal. water gave 93% control, 2,3,6-TCB (in oil) 4 lb./100 gal. water gave 74% and NH_4 sulphamate 78% control of Black Locust and Hackberry; 2,3,6-TCB gave inconsistent control of mixed hardwoods.

4752. ELWELL, H. M. [Editor]. **Control of brush on rangeland and pastures (5 reports)**. *Res. Rep. 14th ann. Nth. Cent. Weed Control Conf.* 1957 (149–52). From *abstr.* in *Weed Abstr.* 7 (5), 1958 (719). O.R.E.

Quercus havardii: 2 applications of 1 lb./acre or 3 applications of 0·5 lb./acre of 2,4-DP, 2,4,5-TP and 2,4,5-T gave 80–90% control. *Yucca* sp.: 2,4,5-TP gave a higher % kill than 2,4,5-T; a 1/3 oil/water emulsion was as good as application in diesel oil at the same total volume rates. *Quercus stellata* and *Q. marilandica*: these were sprayed at the end of March (when making good growth) with 2,4,5-T and 2,4,5-TP, at 1·8 lb./acre. Chemical analysis of the leaves $\geqslant$24 hours after treatment showed (with some exceptions) a 30–40% reduction in soluble sugar, a 10% reduction in alcohol-soluble solids and an increase in alcohol-soluble N.

4753. MEADORS, C. H., FISHER, C. E., and ROBINSON, E. D. **Aerial application of chemicals for control of Sand Shinnery Oak, effects on grass recovery and forage production**. *Abstr. Weed Soc. Amer.* 1958 (25). From *abstr.* in *Weed Abstr.* 7 (12), 1958 (2223). O.R.E.

Two consecutive aerial sprayings of 2,4,5-T, 2,4-DP or 2,4,5-TP at 1 lb. in 1 gal. diesel oil plus 3 gal. water/acre gave 80–90% control of *Quercus havardii*, with consequent improvement of grass production.

4754. RAY, H. C. **Aerial chemical reduction of hardwood brush as a range improvement practice in Arkansas.** *Proc. Soc. Amer. For.* 1958 (1959), (201–5). (Also in *Journal* of *Range Management*, *Portland* 11 (6), 1958 (284–90).)

Discusses the effect on hardwoods of various growth regulators, formulations, dosages, treating times etc., chiefly in connexion with forage, but also for release of Shortleaf Pine, and analyses results of practical operations on 60 farms. Low-volatile esters of 2,4,5-T (2 lb. active principle/acre) (*a*) were found the most effective and economical, with 2,4,5-T amine often about equal and invert emulsions promising. In one test in which (*a*), in 1 gal. diesel oil and 3½ gal. water, was applied to 19 soil types, soil type greatly influenced results. Control % increased with decreasing site index for Pine, with elevation, and with exposure to sun (i.e. poorer moisture conditions). *Fraxinus*, *Acer*, *Crataegus* spp. and *Diospyros virginiana* were highly resistant on all soils. Best time for spraying was 24 May–14 June. Timing of re-sprays, where necessary, depended on soil, age, species, and density of hardwoods. Increase of forage production varied with soil group, vegetation type, and, on Pine sites, age and structure of stands, occasionally reaching 600%. Applications of 2 lb./acre generally caused no serious injury to Pines, but higher concentrations of acid or diesel oil caused some contortion of needles and shoots, and 4 lb./acre sometimes death. Pine seed collected after treatment in May with 2 lb./acre had a germination of 35%, but many treated Pine sites have regenerated satisfactorily.

4755. WOODS, F. W. **Chemical control of Turkey Oak (*Quercus laevis*).** *Abstr. Weed Soc. Amer.* 1958 (31). From *abstr.* in *Weed Abstr.* 7 (12), 1958 (2222). O.R.E.

2,4,5-T (iso-octyl), 2,4,5-TP (butoxy ethanol) and 2,4,5-TP (propylene glycol butyl ether), all at 3 lb./acre and sprayed by helicopter, were respectively the most successful of 9 treatments tested on *Q. laevis*.

4756. RODGERS, E. G., UPCHURCH, R. P., and BURT, E. O. **Response of *Quercus laevis* to herbicides.** *Abstr. Weed Soc. Amer.* 1958 (21–2). From *abstr.* in *Weed Abstr.* 7 (12), 1958 (2224). O.R.E.

Quercus laevis, treated, when 6 ft. tall, with monuron at 10 lb./acre and diuron and fenuron at 16 lb./acre was completely killed by the second growing season; top growth only was killed by 2,4,5-T (propylene glycol butyl ether) at 16 lb./acre, and controlled by 2,4,5-TP (iso-octyl) at 4 lb./acre. *Quercus laevis* was more susceptible during rapid growth. Dalapon at 32 lb./acre suppressed growth for 1 year; NH_4 sulphamate at 200 lb./acre and amino-triazole and 2,3,6-TBA were ineffective.

4757. BALDWIN, H. I., and NATTI, T. **Prevention of stump sprouting**. *Fox For. Note* No. 72, 1959. pp. 1.

Spraying winter-cut stumps in April with 2,4,5-T in fuel oil (1 pint/3 gal.) prevented sprouting of Red Oak, Sugar Maple, Elm, all Birches and Beeches and about half of the White Oaks and Red Maples. Spraying on the snow in January or February prevented sprouting in Sugar Maple and Black Birch, and reduced the % of stumps sprouting and average length of sprouts in Paper Birch, Red Oak, and Red Maple. Spraying was more effective on the larger stumps.

4758. DAHMS, W. G. **Chemical control of brush and undesirable hardwoods on forest land of the Pacific Northwest**. *Abstr. Weed Soc. Amer.* 1958 (29). From *abstr.* in *Weed Abstr.* 7 (12), 1958 (2234). O.R.E.

An aerial foliage spray of 2,4-D or 2,4,5-T controlled *Alnus rubra*; some species of *Arctostaphylos* and *Ceanothus* were killed, others resprouted; *Castanopsis chrysophylla*, *Quercus chrysolepis* and *Lithocarpus densiflorus* were lightly damaged. A basal spray was most promising for *Rubus spectabilis*, and a dormant-season aerial spray for *Acer circinatum*; both species resprouted after foliage spraying.

4759. HAY, J. R. **Effect of a number of chemicals on the control of Poison Ivy. Effect of some herbicides on the control of Poison Ivy. (2 reports.)** *Res. Rep. East. Sect. nat. Weed Comm. Can.* 1958 (110–1). From *abstr.* in *Weed Abstr.* 8 (3), 1959 (456). O.R.E.

Amino-triazole (ATA) 1–3 lb./acre, 2,4,5-TP (ester) 1–2 lb./acre, 2,4-D plus 2,4,5-T 2 lb./acre, NH_4 sulphamate 1 lb./100 sq. ft. and Borascu 3 lb./100 sq.ft., all gave 80–100% control of *Rhus radicans*: 2,4,5-TP and ATA appear to be the most consistent. July applications were better than August, and re-treatment the following year appears to be necessary.

4760. **Weed control**. *Report, Department of Agriculture, Tasmania, Hobart 1956–57*, 1957 (38). From *abstr.* in *Weed Abstr.* 8 (1), 1959 (61). O.R.E.

In localities where summer spraying might cause drift damage, *Rubus* spp. can be controlled by winter spraying with 2,4,5-T 40% at 2 fluid oz./gal. diesel distillate or 40 parts diesel distillate and 60 parts sump oil. B_2O_3, applied twice at 1200 lb./acre with an interval of 3 months, controlled weeds for 1 year.

4761. Cleghorn, W. B., McKay, A. D., and Cronin, C. H. **Results of preliminary arboricide and herbicide trials on a number of species limiting livestock carrying capacity of veld in Southern Rhodesia.** *Paper 1st African Weed Control Conference, Victoria Falls* 1958. pp. 39. 10 refs. From *abstr.* in *Weed Abstr.* 7 (12), 1958 (2215). O.R.E.

Brachystegia spiciformis: 64% As_2O_3 at 16 ml./1-in. of girth gave 80% kill; 5 ml. as a stab application gave 40%. 2,4-D and/or 2,4,5-T at 0·5 and 1% applied to the stumps at 5–16 ml./1-in. of girth gave 10–20% kill; stab application and basal application of the growth regulators and all methods of application of diesel oil were ineffective. The growth regulators were more effective if applied from July to November. NH_4 sulphamate inserted under the bark at 9–18 g./tree (average diam. 12 in.) or applied at 10–20 g./stump was ineffective. Monuron, even at 60 lb./acre, had little effect. Preliminary observations suggest that 2,4,5-T (butyl in oil) at higher rates is promising as a stump treatment. *Isoberlinia globiflora*: As_2O_3 again gave the best results, though 16 ml. on stumps gave only 50% kill, while 8 ml. gave 80%. Reaction to the growth regulators and diesel oil was similar to that of *B. spiciformis*. *Acacia* spp.: monuron and diuron up to 120 lb./acre had little effect. Na arsenite (50%) at 1·5 oz./stump killed 93% of *A. subalata*; paraffin as a basal bark treatment was less effective. *A. karoo* was much less susceptible, the best kill being only 15%. Preliminary observations showed that ring barking, blazing or applying NH_4 sulphamate or 2,4,5-T in water to blazes had little effect on *A. karoo*, *A. subalata*, *A. gerardii*, *A. nigrescens* or *A. rehmanniana*; 2,4,5-T in dieselene, or diesel oil alone, applied to blazes, were promising. *Terminalia sericea*: As_2O_3 (64%) at 16 ml./stump gave 95% kill; 2,4,5-T with or without 2,4-D on stumps gave ca. 50% kill. Stab treatments with all chemicals or basal bark applications of 2,4,5-T were poor. 2,4-D and diesel oil were ineffective. *Acacia rehmanniana* reacted similarly. Various methods of applying 1% 2,4,5-T (isopropyl) in January were compared on several species. Stump treatment gave 80% kill of *Copaifera mopane*, stab treatment 40% kill of *Commiphora mollis*, stump treatment 100% and foliage treatment 60% kill of *Grewia monticola*, foliage treatment 60% kill of *Cissus cornifolia*; stump, stab, bark and foliage treatments were ineffective on *Acacia heteracantha* and *Combretum apiculatum*. *Dichapetalum cymosum*: 4·8% NH_4 sulphamate plus 4% diesel oil plus a wetter at 50 gal./acre had little effect. No regrowth had occurred 16 months after applying 2,4,5-T plus a wetter (0·4%) at 50 gal./acre or 2,4,5-TP at the same rate; less effective were 2,4,5-T in diesel-oil emulsion, 2,4,5-T in water and 2,4-D in water. Monuron and diuron 0·85 and 1·7% at 50 gal./acre were ineffectual.

4762. Ivens, G. W. **Some tree and scrub control problems in East Africa.** *Paper 1st African Weed Control Conference, Victoria Falls* 1958. pp. 5. From *abstr.* in *Weed Abstr.* 7 (12), 1958 (2235). O.R.E.

Dichrostachys glomerata was successfully controlled by 2,4-D (ester) 0·5–1% in oil, applied either as a basal spray or to stumps. Promising results in controlling *Lantana camara* have been obtained in Uganda with 2,4,5-T (ester) applied as an emulsion to regrowth after cutting; seedlings may require further treatment. Woody weed control in Africa is discussed generally, including its economic aspect.

4763. **Herbicides.** *Annual Report, Colonial Pesticides Research Unit Arusha, Dar es Salaam 1957–58, Progress Report* No. 22, 1958 (25–8). O.R.E.

[For results of trials started before March 1957 see *F.A.* 20 Nos. 1982–3.] Subsequent experiments yielded the following results: (1) *Tarchonanthus camphoratus*. Coppicing of stumps was best controlled with 1% 2,4,5-T or 2,4-D ester in oil, though most stumps were still capable of regrowth even after 3 applications in 8 months. Na arsenite applied as a paste to girdled trees at ca. 30 g./tree killed the crowns after 6 months, but the considerable regrowth from below the girdle is greater than in trees treated with 1·5% 2,4-D or 2,4,5-T in oil. (2) *Euclea divinorum*. Variable results were obtained with 1% 2,4-D and 2,4,5-T in water and it appears that the season of application may be important. (3) In trials in Sierra Leone it was found that both *Rhizophora racemosa* and *Avicennia nitida* can be killed by basal stem application to frills of 2,4-D ester (1–2%) in diesel oil.

443. Fungi and Bacteria

See also Nos. 4131–2, 4173, 4186, 4212, 4214, 4239, 4579, 4953, 4964.

4764. Příhoda, A. Zpráva o fytopatologickej kontróle medzinárodnej pokusnej plochy smrekovca na Podbanskom. **[Report on the pests and diseases in the international Larch trial area at Podbansko [High Tatra].]** *Sborn. Prác Tatr. Nar. Parku, Tatr. Lomnica* No. 2, 1958 (160–2). [Slovak.russ.g.]

[Cf. *F.A.* 14 No. 254; 20 No. 4852.] *Armillaria mellea* still remains the greatest single danger, especially for *Larix leptolepis*; there has been an increase in *Dasyscypha willkommii*, and *Cytospora kunzei* has attacked individual branches and crowns damaged by *Adelges*. *Taeniothrips laricivorus* mainly attacks the native Larches. *Dasyneura laricis* has caused considerable damage to buds. Old damage to bark by mice was noted.

4765. Kišpatić, J. Bolesti topola. **[Diseases of Poplar.]** *Topola, Beograd* No. 9, 1959 (719–42). 21 refs. [Croat.f.]

Intended as an aid to the practical man in diagnosis. The most important diseases, mainly fungal, are described and discussed under the headings: leaf diseases, diseases of bark and wood, and wood rots. Two catkin diseases are also mentioned.

4766. Bazzigher, G. **Tannin- and phenol-splitting enzymes of three parasitic fungi.** *Transl. Commonw. sci. industr. Res. Organ. Aust.* No. 4200, 1959. pp. 5 + 1 dgm., 1 gph. Transl. by W. Knie from

Phytopath. Z. 29 (3), 1957 (299–304). [See *F.A.* 19 No. 591.] Limited distribution.

Fungi and Bacteria: Chemical Control

See also Nos. 4131, 4708, 4772, 4775–6, 4790, 4797, 4806, 4813.

4767. LIVINGSTON, J. E., and HILBORN, M. T. **Control of plant diseases by chemotherapy.** *Econ. Bot.* 13 (1), 1959 (3–29). 222 refs.

A review of the history of control of bacterial, fungal, and virus diseases by chemotherapy (i.e. by chemicals that penetrate the host tissues and exert their effect internally). The mode of action of streptomycin, cycloheximide (Acti-dione), sulphonamides, and other chemicals is discussed. Dutch Elm disease and Oak wilt research receive mention.

4768. FISCHER, F., RITTER, F., and ZOBRIST, L. Zur Anwendung 'systemisch' wirkender Mittel an Bäumen. **[On the application of systemics to trees.]** *Mitt. schweiz. Anst. forstl. Versuchsw.* 35 (2), 1959 (273–6 + 5 photos). 8 refs. [G.f.it.e.]

Described and illustrates a modified bandage method of applying systemic fungicides to the boles of Chestnut trees, used in experiments for the control of *Endothia parasitica*. A plastic bag, tight-fitting at top and bottom, with a cottonwool bandage inside, makes it possible to apply and leave for a growing season, measured quantities of fungicide. The 'bag' is made by 'welding' the ends of a polyethylene film with a lamp.

4769. VAARTAJA, O. **A screening test for fungicides not toxic to Pine.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 15 (2), 1959 (2).

[Cf. *F.A.* 18 No. 368.] Further tests have revealed a few new fungicides of promise. Tests were made in agar medium in Petri dishes using *Rhizoctonia solani* and *Pythium debaryanum* as test fungi and *Pinus banksiana* as host species. Of the 88 fungicides tested, about a dozen are considered promising. Mn-Omadine (Mn salt of pyridine ethione 1-oxide) and Dyrene (2,4-dichloro-6-(chloroanilino)-2-triazine) showed a very wide range of useful activity, Dyrene being especially effective against *R. solani.* The range of Bayer 22555 was very wide on *Pythium* but the control did not last for 2 weeks. Dyrene, Cyprex (*n*-dodecyl quinidine acetate) and Cunilate (Cu-8-quinolinol) gave good control at very low concentrations.

443.2. Diseases of Seed and Seedlings; Damping Off etc.

See also Nos. 4534, 4769.

4770. FOSTER, A. A. **Nursery diseases of Southern Pines.** *For. Pest Leafl. U.S. For. Serv.* No. 32, 1959. pp. 7.

Covers damping off, black root-rot, fusiform rust, brown spot, chlorosis, and nematodes, and their control.

4771. HODGES, C. S. **Histological studies of roots of Pine seedlings infected with black root rot.** *Abstr.* in *Phytopathology* 49 (5), 1959 (318).

In the characteristic enlarged, black, roughened areas of diseased roots, the cortex was found to be greatly proliferated, with 10–30 layers of cells against 2–3 in normal root cortex. It did not contain mycelium, though the periderm, also thicker than normal, commonly did. Of the two fungi associated with the disease and pathogenic in inoculation tests, *Sclerotium bataticola* was found to produce IAA, while *Fusarium* sp. did not. Addition of 0·1 p.p.m. of IAA to the nutrient solution stimulated cell division in Pine roots.

4772. VOLGER, C. Versuche über Abwehr und Bekämpfung von Keimlingsmykosen an Koniferen. **[Experiments in preventing and controlling seedling mycoses in conifers.]** *Forstarchiv* 30 (2), 1959 (29–34). [G.g.]

[Cf. *F.A.* 19 No. 4396.] Fifteen pelleting preparations were tested on Pine seed grown in pots. Only those treated with Tripomol, a 50% thiram preparation, clearly showed better resistance to pathogenic fungi than the controls. Other formulations of 50% thiram did not significantly increase resistance. An 80% concentration injured seedling development. In plots sown with seed, (*a*) pelleted with Tripomol, (*b*) unpelleted, and subsequently sprayed with 80% thiram, spraying significantly increased the resistance of seedlings from (*b*) but injured those from (*a*). Twelve pelleting preparations were tested for phytotoxicity to Pine, Spruce, Larch and Douglas Fir; only Phytox Sulphur caused damage to Spruce and Larch needles.

4773. **Mycology. [*Botrytis cinerea* on *Pinus radiata* and *Eucalyptus gigantea*.]** *Rep. For. Res. Inst. N.Z. For. Serv. 1957/58*, 1958 (25).

During the spring, the grey mould *B. cinerea* again became troublesome in Granville Forest, causing the loss of several thousand *P. radiata* seedlings, in the seedling beds, in bundles ready for planting, and in newly planted stock in heavy bracken-fern country. Established *E. gigantea* was also heavily attacked. This is believed to be the first record of damage by this fungus to trees established in plantations.

4774. UROŠEVIĆ, B., and JANČAŘÍK, V. Ophiostomose und Eichenwurzeltöter (*Rosellinia quercina* Hartwig), zwei wichtige Krankheiten der Eichensämlinge. **[*Ophiostoma* sp. and *R. quercina*, two important diseases of Oak seedlings.]** *Z. Pfl-Krankh.* 66 (4), 1959 (193–9). 6 refs. [G.g.e.] E.M.B. [Cf. *F.A.* 20 No. 702.]

4775. **Mycology. [Soil sterilization to control damping off.]** *Rep. For. Res. Inst. N.Z. For. Serv. 1957/58*, 1958 (26).

Rhizoctonia solani was found to be causing damping off in nurseries at Whakarewarewa and Rotoehu —the first time this pathogen has been recorded from New Zealand Forest Service nurseries. A species of *Pythium* also caused damping off and is, in addition, responsible for severe root-rot of older nursery stock. Soil sterilization with formalin and chloropicrin gave good results in reducing mortality, the latter also accelerating seedling growth. In the unsterilized beds, mortality averaged 40%, in the sterilized, ca. 15%. Tree species varied in their susceptibility, mortality ranging from 10% in Douglas Fir to 58% in Corsican Pine.

4776. JAMALAINEN, E. A. **A test on the control of black snow mould (*Herpotrichia nigra* Hartig) in Spruce seedlings by the use of pentachloronitrobenzene [PCNB].** *Valtion Maatalouskoetoiminnan Julkaisuja, Helsinki* No. 148, 1956 (68–71). 2 refs. [E.] L.S.

In preliminary nursery experiments at Iisalmi, one-year Spruce seedlings dusted with 20% PCNB at 250 g./acre in Nov. 1954 showed almost no black snow mould by the next May, while >8% of the untreated plants were attacked.

4777. BIGGS, P. **Studies on *Meria laricis* needle-cast disease of Larch.** *Rep. For. Res. For. Comm., Lond. 1957/58*, 1959 (112–3).

Spore germination experiments indicate that *M. laricis* will germinate only within a narrow range of high humidities. Correlation of data from Forestry Commission nurseries with weather information from the Meteorological Office has shown a definite relationship between temperature and humidity and the appearance of a notable *Meria* attack. [Cf. *F.A.* 20 No. 698.]

443.3. Diseases of Older Stages

See also Nos. 4559, 4959.

Stem, Butt and Root Rots; Root Diseases

See also Nos. 4275, 4295, 4397, 4956.

4778. ESLYN, W. E. **Radiographical determination of decay in living trees by means of the thulium X-ray unit.** *For. Sci.* 5 (1), 1959 (37–47). 16 refs.

[Cf. *F.A.* 18 No. 3003.] A detailed investigation of the limits of the method, illustrated by density curves across the film face and a tabular analysis of the radiographs of 24 *Acer saccharinum* trees containing internal defects. Irregularities, such as fluting, photograph as high-density areas, which are liable to mask decayed areas. The method may thus be of greater use for piles in construction work, telephone poles etc. Improvements in application are suggested.

4779. MAGUNDIKORO, A., and DEPARI, K. S. Gangguan hama dihutan *Pinus merkusii* di Sumatra utara. **[Insect and fungus attack in the *P. merkusii* forests of N. Sumatra.]** *Rimba Indonesia* 7 (10/12), 1958 (417–52). 13 refs. [Jav.jav.e.]

The chief pests are *Milionia basalis*, a Pyralid borer attacking bark, stem and crown, a leaf wasp of the Tenthredinidae and a root fungus, *Armillaria* sp. Chemical control is impracticable and research on the possibility of biological control is needed. Plantations on liparitic soils should consist of mixed Pine and deciduous species to reduce insect and fungus attack. On better soils the primary forests should be converted to plantations. Ploughing planting-strips 1 m. wide may, by changing the physical condition of the soil, give better results than planting in planting holes. Present sales of Pine by the Forest Service to two match factories in N. Sumatra are 1000 cu.m. per month; a third match factory has just been built. *From authors' summary.*

4780. **[Rot in Norway Spruce.]** *Dansk Skovforen. Tidsskr.* 44 (2), 1959 (78–125). Many refs. [Dan.]

Consists of 3 articles with discussion: Review of current studies by the Trametes commission (*E. Holmsgaard*); Heart rot [by *Armillaria mellea* and *Fomes annosus*] of Spruce (*A. Yde-Andersen*); and A preliminary review of studies in central and W. Jutland (*F. Paludan*).

4781. MOLIN, N., and RENNERFELT, E. Honungsskivlingen, *Armillaria mellea* (Vahl) Quél., som parasit på barrträd. **[*A. mellea* as a parasite on conifers.]** *Medd. SkogsforsknInst., Stockh.* 48 (10), 1959. pp. 26. 22 refs. [Sw.e.*e*.]

A discussion, based on literature and the author's investigations in Sweden, of damage done, mode of spread, and economic importance. It is suggested that the fungus, in addition to causing the rapid death of Spruce and Pine observed in several stands, is responsible for a slow wasting disease which occurs in Central Sweden, known as 'grantorka' ['drying of Spruce']. On several plots, investigated for 10 years, most of the dead or dying stems had layers of *A. mellea* mycelium between bark and wood. Infection was apparently most virulent on good sites. On many sites it led only to a kind of pseudomycorrhiza that did no harm beyond perhaps a slight reduction of growth. Certain cases of stem rot, mostly with hollow butts, differing in appearance from normal *Fomes annosus* rot, could be clearly attributed to *A. mellea*, and ca. 15% of the stem rot in Swedish Spruce is thought to be so caused [cf. *F.A.* 20 No. 705]. Stump poisoning has been suggested to counter the build-up of potential foci of infection, but most stumps of trees chemically barked with As preparations were heavily infected with the fungus.

4782. PIUSSI, P. Su di una carie dell'abete rosso. **[A rot of *Picea abies*.]** *Monti e Boschi* 10 (4), 1959 (174–81). 13 refs. [It.f.e.]

A number of *P. abies* in a mixed Spruce/Beech stand were found to be infected with heart rot. On many of these, sporophores of *Fomes pinicola* were observed, and the author suggests that this usually saprophytic fungus had attacked trees already weakened by soil degradation following excessive opening of the canopy.

4783. LOMAN, A. A. **The distribution of red stain in Lodgepole Pine of peeler quality.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 15 (2), 1959 (2–3).

Red stain of *Pinus contorta* var. *latifolia* heartwood due to infection by one or more fungi, including *Stereum pini*, *S. sanguinolentum*, *Fomes pini* and *Polyporus anceps*, is believed to affect adversely the strength and gluing properties of the veneer, and a survey of its extent was made on 140 trees felled and sectioned at intervals of 8 ft. 7 in. The trees examined averaged 140 years, 87 ft. in height and 12·9 in. d.b.h. The volume of wood affected by red stain and decay amounted to 8·3% if logs were used for plywood (min. top diam. 10 in.) and 8% for pulpwood (min. top diam. 4 in.). The % of infected trees generally decreases in the larger diam. classes, but increases in the small, scattered class of large-diam. (>17 in.) open-grown trees that make up ca. 7% of the total number of trees in a stand.

4784. GRUSCHOW, G. F., and TROUSDELL, K. B. **Incidence of rot in hardwood sawtimber in [an unmanaged, old-growth Loblolly stand in] coastal North Carolina.** *J. For.* 57 (5), 1959 (370–1).

[Cf. *F.A.* 19 No. 4006.] Of total cull volume due to rot, 70% was in Grade-4, and 20% in Grade-3 trees, i.e. trees that would have been removed first under management. Many hardwoods found in unmanaged Pine forests cannot be considered as good growing stock.

4785. TOOLE, E. R. **Decay after fire injury to southern bottom-land hardwoods.** *Tech. Bull. U.S. Dep. Agric.* No. 1189, 1959. pp. 25. 15 refs.

A total of 1141 fire-scarred trees in Mississippi and Louisiana were felled and dissected, and rot fungi isolated and identified. The results, statistically analysed, demonstrated the importance of fungus species, wound age, and wound size in determining the rate of decay. Indicators of help in estimating the extent of decay in a standing tree are length of hollow and height of butt swelling. The length of heart rot is closely correlated with diameter of rot at stump height.

4786. TOOLE, E. R. **Canker-rots in southern hardwoods.** *For. Pest Leafl. U.S. For. Serv.* No. 33, 1959. pp. 4. 5 refs.

The three species described (*Polyporus hispidus*, *Poria spiculosa* and *Poria laevigata*) are mainly heartrots, but also often attack sapwood and cambium, causing visible cankers.

4787. MORANI, V., and ARRU, G. M. Accumulo di gas entro pioppi in vegetazione. **[Gas accumulation in growing Poplars.]** *Ricerca Scientifica, Roma* 28 (1), 1958 (146–51). 15 refs. [It.it.f.e.g.] E.M.B.

Seventeen-year-old hybrid Black Poplars growing on a marsh soil near Pisa showed a bacterial infection in the central part of the stem, similar to wetwood. Data are given from analyses of the soil, the diseased wood, the liquid issuing from it after sawing or drilling, and the gas accumulating in the fibre bundles of the central zone where fermentation occurs. The composition (by volume) of the gas was: 53·6% CH_4, 28·4% N, and 17·6% CO_2. It is supposed that denitrifying and CH_4-producing bacteria took part in the fermentation.

4788. TRIONE, E. J. **The pathology of *Phytophthora lateralis* on native *Chamaecyparis lawsoniana*.** *Phytopathology* 49 (5), 1959 (306–10). 9 refs.

[Cf. *F.A.* 20 No. 722.] Experiments on aerial and soil infection indicated that the activity of the pathogen was highly seasonal, and suggest that the resistant chlamydospores and oospores produced in foliar tissue form an important oversummering stage. The disease spread more rapidly where removal of diseased trees had disturbed the soil, than in untouched stands.

4789. BAKSHI, B. K., ARORA, K. K., and SINGH, S. **Root diseases of Shisham (*Dalbergia sissoo* Roxb.). VII. Physiological studies on the wilt organism, *Fusarium solani*.** *Indian For.* 85 (5), 1959 (310–3). 4 refs.

[Cf. *F.A.* 19 No. 1949.] Studies carried out at Dehra Dun led to the following conclusions: *F. solani* grows at a wide pH range, with optimum growth at 4·45–5·0. At pH values below the optimum, *F. solani* tends to raise the pH of the medium towards them, and at pH above the optimum, to lower it. The pH of *D. sissoo* roots, whether diseased or healthy, lies between 4·6 and 5·2, and soil pH appears not to influence the pH of the roots, which possess a high buffering capacity. The pH values of *D. sissoo* roots are also the optimum for growth of *F. solani*, which makes them peculiarly susceptible to infection. Study of wilted and healthy trees indicated that there is no difference between them in the moisture content of roots and stems; the fungus is able to colonize roots with normal m.c.

Wilts, Diebacks etc.

See also Nos. 4237, 4964.

4790. BECKMAN, C. H. **Dutch Elm disease control with polychlorobenzoic acid.** *Abstr.* in *Phytopathology* 49 (4), 1959 (227).

Twenty-five Elms, 12–18 ft. tall, were treated at bud break (*a*) and 25 at full leaf (*b*) by painting a 2-in.-wide band of 2,3,5,6-tetrachlorobenzoic acid (65% in oil) round their bole, with or without the addition of chlorides of Ca, Mg, Mn, or Fe (500 p.p.m.). These and 20 untreated controls (*c*) were inoculated with *Ceratostomella ulmi* in June and July. Infection rates in September were 16% for (*a*), 52 for (*b*) and 95 for (*c*). Infection was lowest and injury only slight for (*a*) treatments without salts. Results support the suggestion that growth inhibitors that penetrate bark and are mobile within the tree might control the disease [cf. *F.A.* 19 No. 4419].

4791. **Root grafts in Oak.** *Rep. Cent. St. For. Exp. Sta. 1958*, [1959] (6–7).

A suspension of spores of Oak wilt fungus in a water solution of red organic dye was introduced into stumps of 89 Black and 86 White Oaks, revealing 11 and 17% of root grafts respectively. One graft occurred between a Black Oak and a Blackjack Oak. Eight multiple grafts in which >2 trees were connected to a common root system were also revealed. In Missouri the greatest measured distance between connected trees is 36 ft. The incidence of grafting appears to be too low to account for much of the annual spread of Oak wilt in this State.

4792. MORIONDO, F. Su una moria di pioppi in Val di Nievole. **[[Fungus] damage to Poplars in the Val di Nievole.]** *Ann. Accad. ital. Sci. for.* 7, 1958 (189–95). 13 refs. [It.f.]

Describes the damage caused by *Stereum purpureum* to stands of *Populus* 'Eucalyptus Sarcé.'

4793. ***Verticillium alboatrum* Reinke & Berth.** *Distr. Maps Pl. Dis.* No. 365, 1959. pp. [2].

4794. ENDE, G. VAN DEN. Untersuchungen über den Pflanzenparasiten *Verticillium albo-atrum* Reinke et Berth. **[Investigations into *V. albo-atrum*.]** *Acta bot. neerland.* 7 (5), 1958 (665–740 + 4 plates). 78 refs. [G.g.e.] O.B.D.

Presents the results of studies of morphology, physiology, life cycle, formation of toxins, pathogenicity, behaviour in the soil, and control.

Cankers, Stem Rusts etc.

See also Nos. 4299, 4410, 4478, 4786.

4795. MANNERS, J. G. **Relationship between Larch canker and *Trichoscyphella willkomii*.** *Rep. For. Res. For. Comm., Lond. 1957/58*, 1959 (111–2).

[Cf. *F.A.* 19 No. 618.] Preliminary experiments on the persistence of cankers produced by inoculation of European Larch with this fungus, have shown that repeated freezing may reactivate dormant cankers and thus be of importance in relation to the persistence of cankers. Experiments on the effects of the presence of the fungus on areas of Larch stem damaged by local freezing are still in progress: an interim assessment indicates that frost-induced cankers normally heal within 2 years, but that if inoculated with a spore suspension of the fungus at the time of freezing, they may develop and persist for longer periods.

4796. BERRY, C. R., and HEPTING, G. H. **Pitch canker of Southern Pines.** *For. Pest Leafl. U.S. For. Serv.* No. 35, 1959. pp. 3. 5 refs.

Describes symptoms, pathogen (*Fusarium lateritium* f. *pini*), damage and control.

4797. KRSTIĆ, M., and HOČEVAR, S. Naša proučevanja v zvezi z zatiranjem endotioze. **[Trials in control of *Endothia parasitica*.]** *Gozd. Vestn.* 16 (8/9), 1958 (225–43). 3 refs. [Sloven.g.f.]

Investigates the duration of the vitality and virulence of *E. parasitica* on infected Chestnut material (*a*) left on the ground, and (*b*) buried 15 to 50 cm. deep. Pycnospores remained alive until the pycnidia had been completely destroyed; mycelia in the bark remained alive until the bark became rotten. With (*a*) destruction of bark pycnidia began after ca. 6 months, with (*b*) rather sooner, especially at 15 cm. Mycelia remained alive for 15 months in both (*a*) and (*b*). The virulence of the fungus persists as long as the vitality of the pycnospores and mycelia. A 1% concentration of Tormona-80 was required to kill 2- and 3-year coppice [cf. *F.A.* 16 No. 655]. A mixture of 25 c.c. Tormona-100 in 1 litre diesel oil, painted on the shoots, also gave 100% kill. A mixture of Kreozan (DNC) and Na_2SiF_6 also gave 100% kill but was uneconomic to apply. Kreozan alone (2·5–10%) proved ineffective.

4798. VIVANI, W. Note sulla 'batteriosi del pioppo'. **[Notes on bacterial disease of Poplar.]** *Cellulose e Carta* 10 (2), 1959 (3–15). 8 refs. [It. f.e.g.]

Describes research carried out over 14 years at Casale Monferrato. Clones I 154, I 214, and I 455 have been found to be highly resistant and of excellent form and good paper-making properties. Differences in symptoms between clones are described. Notes are given on the distribution and spread of the disease and damage caused by it. The relation between the disease and *Rosellinia necatrix* isolated from diseased trees is discussed and the suggestion made that temporary impairment of the root system may favour the disease.

4799. HUBBES, M. Untersuchungen über den Erreger des Rindenbrandes der Pappel. **[Experiments on *Dothichiza populea*.]** *Forstarchiv* 30 (2), 1959 (25–9). [G.] (Also a fuller version in *Phytopath. Z.* 35 (1), 1959 (58–96). [G.g.e.] O.R.S.)

Gives the results of laboratory experiments on differences in biological behaviour (growth rate, temperature relations, staining of the culture solution and pathogenicity) of *Dothichiza populea* from 9 different sources. Mycelial injections were successful on *Populus* × *robusta* plants in a varying temperature range of 3–30° C. and at a constant temperature of <12°. Weak greenhouse plants defoliated and sprayed with a spore suspension were infected through the lenticels but only sparsely through the the leaf scars. Intact one-year plants were successfully infected; 5-month seedlings were not. A toxin isolated from the cultures, apparently a polysaccharide, caused irreversible wilting in unlignified Poplar shoots.

4800. BLOOMBERG, W. J. **Some physiological and anatomical characteristics of *Populus* spp. as related to infection by *Cytospora chrysosperma* Fr.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 15 (2), 1959 (3).

Differential resistance to *C. chrysosperma* canker was observed in 3 kinds of Poplar in a nursery in British Columbia, resistance increasing in the order *Populus trichocarpa*, *P.* × *regenerata* and *P.* × *robusta* var. *bachelieri*. Laboratory experiments with cuttings of these species demonstrated a negative correlation of the bark moisture content and canker growth. Experiments with fixed levels of both atmospheric moisture and m.c. of cuttings showed significant differences of canker growth rate between levels for both factors and all species. Greenhouse experiments with 4-month-old plants of *P.* × *regenerata* and *P* × *robusta* showed that infection could be obtained only if the plants were subjected to a drought régime and exposed to low atmospheric humidity. Anatomical differences discovered in the wood and bark tissues of the 3 Poplars suggest a basis for differences in water economy and hence differences in resistance to *Cytospora* infection. Differences occurred between species in pith size, vessel number and lumen diameter, sieve-tube number and diameter, periderm thickness, number and arrangement of phloem parenchyma, compactness of cortex, and other factors determining the efficiency of the stem in water storage, translocation, and retention.

4801. MORIONDO, F. Un grave pericolo per le pinete italiane: la ruggine vescicolosa della corteccia. **[A serious threat to Italian Pine forests: blister rust on bark.]** *Ann. Accad. ital. Sci. for.* 7, 1958 (197–206 + 8 photos, 4 gphs.). 15 refs. [It.f.]

Discusses various conditions that might account for attacks by *Cronartium asclepiadeum* on *Pinus pinaster* and *P. halepensis* in certain forests in Tuscany.

4802. KISPATIĆ, J. Pojava rđe na alepskom boru u Istri. **[*Cronartium asclepiadeum* on *Pinus halepensis* on the Istrian peninsula.]** *Šum. List* 83 (1/3), 1959 (26–38). 27 refs. [Croat.g.]

Describes damage by the bark rust *C. asclepiadeum*, to *P. halepensis*, not hitherto recorded as a host, in young plantations on coastal sites. Notes are also given on the systematics and silvicultural control of the fungus. Literature on *Cronartium* spp. on conifers is briefly reviewed.

4803. BEGA, R. V. **The capacity and period of maximum production of sporidia in *Cronartium ribicola*.** *Phytopathology* 49 (1), 1959 (54–7). 9 refs.

Describes experiments, including methods, on measuring sporidia production of individual telial columns formed on *Ribes aureum* or *R. nevadense* at constant temperatures of 16 or 20° C. or (*R. aureum* only) in the open. Quantity and duration of production appeared to depend largely on size and age of the columns. It began 6–11 hours after the columns were subjected to 100% humidity by attaching them to agar blocks. One 10-day-old representative column, 1330 × 105 μ, cast 4930 sporidia in 70 hours with a peak between the 14th and 45th hours, another, 770 × 73·6 μ cast 2954 in 43 hours, with a peak between the 11th and 30th hours. Artificial light had no effect on germination of teliospores and subsequent casting of sporidia.

Foliage Diseases

4804. ZILLER, W. G. **Studies of Western tree rusts. IV. *Uredinopsis hashiokai* and *U. pteridis* causing perennial needle rust of Fir.** *Repr.* from *Canad. J. Bot.* 37, 1959 (93–107 + 3 plates). 13 refs.

Field observations and inoculations show that the perennial needle rust of *Abies* spp. known as *Peridermium pseudo-balsameum* is caused by *Uredinopsis hashiokai* and *U. pteridis*, which complete their life cycles (described) on *Pteridium aquilinum*. The two species are indistinguishable in most states; they differ in geographical distribution and in the morphology of their urediniospores. It is unknown which of them represents the perfect state of *P. pseudo-balsameum*.

4805. ZILLER, W. G. **Studies of Western tree rusts. V. The rusts of Hemlock and Fir caused by *Melampsora epitea*** *Repr.* from *Canad. J. Bot.* 37, 1959 (109–19 + 2 plates). 17 refs.

Inoculation experiments have shown that *Caeoma dubium*, the needle rust of *Tsuga* spp., represents the aecial state of a new race of *Melampsora epitea*, for which the name *M. epitea* f. sp. *tsugae* is proposed. This race differs morphologically from most species of *Melampsora*, but is indistinguishable from the Fir rust *M. abieti-capraearum* except in its aecial hosts. Its taxonomy, morphology and life history are described. *From author's summary.*

4806. SCHÖNHAR, S. Erfahrungen bei der Bekämpfung der Kiefernschütte in Südwestdeutschland. **[Practical experience in the control of *Lophodermium pinastri* in S.W. Germany.]** *Allg. Forstzeitschr.* 14 (18), 1959 (351–2). 3 refs. [G.]

Spraying with zineb, 3–5 times in nurseries, twice in plantations, gave good control. Use of fine spraying equipment with concentrated solutions (1·2%) saved water and time compared with 0·3% solutions in coarse sprays. In plantations 5–12 years old, a single treatment by helicopter was successful. [Cf. *F.A.* 19 No. 3175.]

4807. DEIGHTON, F. C. **Studies on *Cercospora* and allied genera. I. *Cercospora* species with coloured spores on *Phyllanthus* (Euphorbiaceae).** *Mycol. Pap. Commonw. mycol. Inst.* No. 71, 1959. pp. 23.

4808. VISWANATHAN, T. S. **A new species of *Ciliochorella* on *Eucalyptus globulus* L.** *Curr. Sci.* 28 (4), 1959 (171). 3 refs. A.P.B.

A species of *Ciliochorella* found on dried leaves of *E. globulus* in Bombay is described and named *C. eucalypti.*

4809. PETTINARI, C. M. *Cycloconium* sp. su alcuni esemplari della flora mediteranea sempreverde. **[*Cycloconium* sp. on some Mediterranean evergreen species.]** *Bollettino della Stazione di Patologia Vegetale, Roma* (*Ser.* 3) 15 (1), 1957 (1958), (139–55). 10 refs. [It.it.e.] E.M.B.

Describes the biological and morphological characters of *C. querci-ilicis*, found on *Quercus ilex* leaves in Italy, and of *C. phillyreae*, found on *Phillyrea variabilis* and occasionally on *Ligustrum vulgare*. Experimental infection of leaves of young Olive-trees by conidial suspensions gave positive results only in the first stages of the disease.

4810. BITANCOURT, A. A., and JENKINS, A. E. Estudos sôbre as Miriangiales. VIII. A antracnose maculada da seringueira causada por *Elsinoë*. **[Studies in the Myriangiales. VIII. A spot anthracnose of *Hevea*, caused by *Elsinoë*.]** *Arquivos do Instituto Biológico, São Paulo* 23, 1956 (1957), (41–66 + 4 plates). 41 refs. [Port.e.] E.M.B.

[Cf. *F.A.* 13 No. 3120.] Describes a new anthracnose on *Hevea brasiliensis* in Brazil and Guatemala. The pathogen of the disease is *Elsinoë heveae* sp. nov., with the name *Sphaceloma heveae* sp. nov. for the conidial stage. The life history of the fungus is described.

4811. JENKINS, A. E., BITANCOURT, A. A., and GOIDANICH, G. Estudos sôbre as Miriangiales. IX. *Elsinoë* sôbre carvalho (*Quercus* spp.). **[Studies in the Myriangiales. IX. *Elsinoë* on *Quercus* spp.]** *Arquivos do Instituto Biológico, São Paulo* 23, 1956 (1957), (117–23 + 2 plates). 5 refs. [Port.e.] E.M.B.

Discusses the taxonomy of *Elsinoë* spp. found on leaves of *Q. ilex* (from Italy), *Q. nigra* (Florida), and *Q. serrata* and *Q. amamiana* (Japan).

4812. MILATOVIĆ, I. Palež lišća divljeg kestena. **[*Guignardia aesculi*, a leaf-blotch disease of Horse Chestnut.]** *Zašt. Bilja* No. 38, 1956 (109–11). 7 refs. [Croat.e.] I.M.I.

A brief account of the life history and type of damage, naming places of outbreak in Jugoslavia in 1956. [Cf. *F.A.* 20 No. 5008.]

Other Diseases caused by Fungi or Bacteria

4813. LIGHTLE, P. C. **Cone rust on Slash Pine controlled by ferbam.** *Abstr.* in *Phytopathology* 49 (5), 1959 (318).

A spray of 2 lb./100 gal. water greatly reduced infection by *Cronartium strobilinum* if the flowers were treated in late stages of their development. No phytotoxic effects were observed, but number and viability of seeds in treated and untreated cones have yet to be compared.

4814. DUDMAN, W. F., and NICHOLS, R. **Absence of gibberellin-like substances in filtrates of *Marasmius perniciosus* Stahel (witch broom of Cacao).** *Nature, Lond.* 183 (4665), 1959 (899–900). 1 ref.

Cacao plants infected with *M. perniciosus* produce excessive and abnormal branching and it has been suggested that this condition might be caused by the production *in vivo* of gibberellin-like compounds by the fungus. The experiments described in this paper, designed to detect the production of such a substance by *M. perniciosus* freshly isolated from an infected Cacao tree, gave negative results, but filtrates of *Fusarium moniliforme*, used as an index of the production and behaviour of gibberellic acid, gave a marked elongation of the stem by typical internodal elongation when applied to the terminal buds of Cacao seedlings.

444. Virus Diseases

See also No. 4131.

4815. SAHO, H. **On the amino acids of *Paulownia tomentosa* (Thunb.) Steud. affected by witches broom. Part I. The amino acids of leaves and twigs.** *J. Jap. For. Soc.* 39 (11), 1957 (447–51). 15 refs. [E.Jap.e.jap.]

No difference in either the ethanol- or the HCl-extracted amino acids (a.a.) was found between leaves from healthy trees and healthy-looking leaves from diseased trees, but the small leaves of diseased twigs had $<\frac{1}{5}$ of the total a.a. contents of the HCl extracts and lacked leucine and arginine. No ethanol-extractible a.a. were found in diseased twigs. [Cf. *F.A.* 19 No. 4437.]

4816. BLATTNÝ, C. Viróza a z virózy podezřelá nemoc trnovníku akátu (*Robinia pseudoacacia* L.). **[A virus suspected of causing a disease of *R. pseudoacacia*.]** *Sborn. čsl. Akad. zeměd.* (*Lesn.*) 5 (3), 1959 (291–4). 5 refs. [Cz.cz.russ.g.]

Describes two diseases of *R. pseudoacacia* in Czechoslovakia. One is either identical with or very closely related to the brooming disease known in the U.S.A., and was noted at several sites in Bohemia and Slovakia. The other, which causes leaf deformation, has been noted at several sites in Slovakia. It is probably due to a virus and resembles virosis of *Gleditsia triacanthos* observed in Bulgaria. The symptoms of both diseases are described, but little or nothing else is known about them.

4817. DEIGHTON, F. C., and TINSLEY, T. W. **Notes on some plant virus diseases in Ghana and Sierra Leone.** *J. W. Afr. Sci. Ass.* 4 (1), 1958 (4–8). 5 refs. H.S.B.

Among the tree and shrub hosts listed are species of *Spondias*, *Adansonia*, *Cassia*, *Combretum*, *Ricinodendron*, *Erythrina*, *Morinda*, *Melochia*, *Waltheria*, *Cola* and *Trema*.

45. Damage by Animals

451. Mammals

See also Nos. 4051–2, 4119, 4212, 4214, 4378, 4388, 4397, 4490, 4493–5.

4818. DUNCAN, D. A., and WHITAKER, L. B. **Repellents reduce cattle browsing on Pines.** *Sth. For. Note Sth. For. Exp. Sta.* No. 119, 1959 [2–3].

When Slash Pine seedlings were treated with TMTD (thiram), ZAC, ZIP (a commercial rabbit or deer repellent containing 30% ZAC) and $CuCO_3$ plus asphalt emulsion [cf. *F.A.* 20 No. 2040] either by spraying before lifting, bundle dipping before planting, or spraying after planting, those sprayed with $CuCO_3$ and baled for transport were severely injured by the treatment but the other combinations substantially reduced browsing damage without harming the plants.

4819. EADIE, W. R. **Animal control in field, farm and forest.** The Macmillan Company, New York. 1954. pp. 257. Many refs. Price $1.75 [14*s*.]

Covers the ecology, life history, habits, economic status and control of wild mammals in the U.S.A. A selected bibliography is provided for each of the 12 main groups dealt with.

4820. RINEY, T. **Influence of land-use on large-mammal problems in New Zealand.** *New Zealand Science Review, Wellington* 16 (3/4), 1958 (33–6). 9 refs. (Paper presented at the 9th Pacific Science Congress, Bangkok 1957.) L.S.

Includes a short analysis of the problems in commercial and protection forest.

4821. SCHULZ, H.-E. Der Wildschaden in den Wäldern der Deutschen Demokratischen Republik. **[Damage by wildlife in the forests of E. Germany.]** *NachrBl. dtsch. PflSchDienst., Berlin* 13 (1/2), 1959 (1–8). 5 refs. [G.g.russ.e.]

Summarizes reports from 492 information centres on damage to the forests by deer, wild boar, moufflon, hares and rabbits during 1957. Barking damage was heavy, especially by red deer to Spruce and 5- to 15-year Pine. Browsing by red and roe deer and by hares increased during the year.

4822. BÖSENER, R. Ermittlungen über die Ernährungsweise des Muffelwildes (*Ovis musimon*

Schreber 1782). **[Feeding habits of the moufflon (*O. musimon*).]** *Arch. Forstw.* 7 (10/11), 1958 (874–87). 8 refs. [G.g.russ.e.]

In 1955 the author enumerated the moufflon population of E. Germany, reporting 750 in 65 forest areas which can be considered as 20 self-contained ranges. Browsing damage, similar to that by deer, occurs on all economic tree species; also bark scaling of stems of Ash, Oak, Beech, and Spruce and the roots of *Pinus contorta* and Spruce. The exclusive or preponderating feeding on worthless vegetation attributed to this animal in literature is considered improbable. Its numbers should be added to the deer population for estimating economic limits in their stocking.

4823. **Deer browse surveys in northern hardwoods and Aspen-Balsam Fir.** *Rep. Lake St. For. Exp. Sta. 1958*, 1959 (19).

In second-growth northern hardwoods in the Argonne Experimental Forest, deer browsing occurred on 77% of observation plots carrying 2- to 7-ft. regeneration. Browsing was heaviest on areas that had had a light partial cut, the recommended system for this type, and least on areas clear-felled, clear-felled in strips, or felled to an 8-in. diam. limit although these areas had the highest % of plots stocked with 2- to 7-ft. regeneration. On an Aspen/Balsam Fir felling site, preliminary observations indicated that Red Maple and Aspen, competitors with the conifers, are being eliminated by snowshoe hare and deer, whereas Balsam Fir and Spruce are browsed very lightly.

4824. **[Logging slash protects tree reproduction against deer.]** *Rep. Ntheast For. Exp. Sta. 1958*, 1959 (20).

On a test area in the Pocona Experimental Forest, on which slash was left after felling to an 11-in. diam. limit in 1951, reproduction ⩾3 ft. high of desirable species (Black Cherry, Yellow Birch, Red Maple) had a density of ca. 1118 stems/acre, vs. 84/acre where no slash was left. The amount of Beech reproduction, which is not much eaten by deer, was unaffected by slash.

4825. HATT, P. Qui s'y frotte s'y pique. **[Protection of young trees against rubbing by game.]** *Rev. for. franç.* 11 (3), 1959 (224–8). [F.]

Describes a simple device that has proved successful on deciduous trees not protected by chemical repellents. Sheet iron is cut into triangles (35 cm. base and 7 cm. high), 2 sawcuts made parallel to the base at half height, and the two longer points bent back at right angles. This device is nailed to a post beside the tree, so that the bent-back points guard the tree, and the two shorter points stick out at the side. The cost is ca. Fr. 40/tree.

4826. SCIEUR, M. Considérations sur les clôtures comme moyen de protection contre les dégats de gibier. **[Fencing as a means of protection against game damage.]** *Bull. Soc. for. Belg.* 66 (5), 1959 (279–98). 9 refs. [F.]

Discusses types of fence, costs etc., and concludes that proper management of game and cooperation between the forester and the sportsman is the best method of protection.

4827. TACKLE, D. **A further test of tree bands for cone protection.** *J. For.* 57 (5), 1959 (373). 1 ref.

[Cf. *F.A.* 19 No. 646.] In further trials, bands only 14 and 16 in. wide prevented squirrels from climbing. The 14-in. bands are the minimum effective size.

4828. DODGE, W. E. **An effective poison and repellent for porcupine control.** *J. For.* 57 (5), 1959 (350–2). 7 refs.

In trials with aldrin, endrin, dieldrin, thiosemicarbazide, and Na arsenite, the last mentioned, in a powder form, proved the most effective poison. Apples, particularly Baldwins and Red Delicious, were the best bait, and 75–300 mg. of technical Na arsenite the best dosage. In addition, 19 different repellents were investigated; β nitrostyrene (prepared from benzaldehyde and nitromethane), mixed in a 20–25% concentration with 10% Altox 4500 as the emulsifying agent plus Geon 145 × 3 latex adhesive, has given 75–90% protection in all tests. The material is easily painted or sprayed and weathers well on buildings etc., but it has not yet been tested for phytotoxicity.

4829. HOLMES, G. D., BROWN, R. M., and URE, R. M. **Preliminary experiments on the use of Toxaphene and endrin for the control of short-tailed voles [*Microtus agrestis*] in young forest areas.** *Rep. For. Res. For. Comm., Lond. 1957/58*, 1959 (148–56). 6 refs.

Preliminary trials on 2-acre plots showed high levels of control with endrin at 0·3 lb. and Toxaphene at 2·25 lb./acre; total costs were ca. £2 10s./acre. Toxicity hazards to other animals are not yet known.

4830. PETROVIĆ, N., and VASIĆ, M. Masovna pojava poljske voluharice i njeno suzbijanje u lovno-šumskom gospodarstvu 'Košutnjak.' **[Outbreak and control of *Microtus arvalis* at Košutnjak [Serbia].]** *Šumarstvo* 11 (9/12), 1958 (663–5). [Serb.]

M. arvalis, causing severe damage to roots of *Populus serotina*, *P. robusta* and *P. marilandica* as well as to other species in nurseries and young plantations, was controlled by bait containing Zn_3P_2.

4831. ŠLANDER, J. Škoda po glodavcih na iglastem drevju. **[Rodent damage to conifers.]** *Gozd. Vestn.* 16 (10), 1958 (289–300). 7 refs. [Sloven.]

Discusses and illustrates damage to buds, shoots and bark by *Arvicola glareolus*, *Myoxus glis* and *Muscardinus avellanarius*.

4832. JURÍK, M. Príspevok k poznávaniu požerkov hlodavcov. I. **[Recognizing feeding by rodents. I.]** *Zool. Listy, Brno* 7 (2), 1958 (135–42 + 3 plates). 12 refs. [Slovak.slovak.russ.g.] O.R.S.

Describes and presents photographs illustrating the damage to Hazel and Walnut shells, fruit of

Cornus mas, and snail shells, caused in feeding by *Eliomys quercinus*, *Glis glis*, *Dryomys nitedula*, *Sciurus vulgaris* and *Apodemus flavicollis*.

452. Birds

See also Nos. 4494–5.

4833. KLÍMA, M. Některé nové poznatky o kroužkování stromů datlovitými ptáky. [**Notes on partial girdling of trees by woodpeckers.**] *Zool. Listy, Brno* 8 (1), 1959 (33–6 + 1 plate). 9 refs. [Cz.russ.g.] O.R.S.

Describes results of observations in 1956–57 in the virgin forest reserve of Boubin, discussing tree species injured (*Abies alba* and *Picea abies*), position, age and size of trees attacked, side of the tree injured (usually S., S.E. or S.W.) and height on the tree of the injury, species of woodpecker concerned, and duration of attack (throughout the growing season). [Cf. *F.A.* 17 No. 586.]

453. Insects

See also Nos. 4165, 4173–4, 4212, 4214, 4216, 4239, 4519, 4569, 4579, 4617–8, 4764, 4779, 4964, 5034.

4834. **Forest insects.** *J. For.* 57 (4), 1959 (243–89). Many refs.

A number devoted to forest insects, containing the following articles: Forest insect research and control (*W. L. Baker*); Every forester has a stake in forest insect spraying (*W. V. Benedict*); Effects on fish and wildlife of chemical treatments of large areas (*J. L. George*); Development of forest insect research and control in Canada (*M. L. Prebble*); Answers to some criticisms of aerial spraying in forest management (*R. L. Furniss*); Airplane spraying in forest insect control—equipment and techniques (*J. S. Yuill* and *D. A. Isler*); What about biological control? (*P. B. Dowden*); The gypsy moth control program (*W. V. O'Dell*); Bark beetle control (*N. D. Wygant*); The Douglas Fir bark beetle epidemic on the Millicoma forest: methods used for control and salvage (*A. V. Smyth*); Control of insects through silvicultural practices (*S. A. Graham*); Systemics in the control of forest insects (*J. A. Rudinsky*); Biological evaluation of outbreaks of forest insects (*J. W. Bongberg*); and The first decade of the Pest Action Councils (*E. L. Kolbe*).

4835. PETERSON, L. O. T. **Shelterbelt entomology.** *Rep. Dom. For. Nursery Sta. Sask. 1958*, [1959] (5–7).

Seasonal development and control of the Elm scale, Lecanium coryli L. The Elm scale *L. corni* Bouché is considered to be the same species as *L. coryli* L., and is an important pest of American Elm in Saskatchewan. Good control was obtained by spraying with Malathion 50% emulsion at 4 pints/gal. water on 14 April to control the overwintered nymphs (74% kill), and on 8 August to control newly hatched nymphs on leaves. Diazinon 25% emulsion also gave good results.

Life history of the Cecropia moth, Hyalophora cecropia L. In shelterbelts, Cecropia larvae feed chiefly on the foliage of Manitoba Maple [*Acer negundo*]. A laboratory and field study was made of the life history. Larvae ate Maple foliage readily, Ash foliage less readily. Elm foliage was rejected by the first instar. Consumption of foliage by the 5th instar was greater than by the combined earlier instars.

Biology and control of Spruce cone insects. A pre-pollination spray, using 2 lb. DDT 50% wettable in 40 gal. of water reduced infestation by *Laspeyresia youngana* but was injurious to cone flowers; a post-pollination spray gave no control.

Control of Pine needle scale, Phenacaspis pinifoliae (Fitch). Numerous first-stage nymphs caught on tanglefoot bands on tree trunks showed that air currents were important in the dispersal of *P. pinifoliae* during the crawler stage. Malathion was very destructive to larvae and adults of the predator, *Microweisia marginata*. For untreated trees, the predator population level was 229/sq.ft. of ground area covered by the tree canopy; application of Malathion spray reduced it to 4·6, and 2 annual applications to 1·4.

4836. ROSE, A. H., and SMEREKA, E. P. **Insects on Trembling Aspen [*Populus tremuloides*].** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 15 (2), 1959 (1–2).

A study is being conducted in N.W. Ontario. The most abundant species are *Gonioctena americana*, *Rhabdophaga* sp., *Enargia decolor*, *Xylomyges dolosa*, *Epinotia nisella*, and *Sciaphila duplex*.

4837. GÄBLER, H. Beiträge zur Kenntnis der Schadinsekten der Blüten und Samen von Forstgehölzen. [**Insects damaging flowers and seeds of woody forest plants.**] *Arch. Forstw.* 7 (10/11), 1958 (786–827). 71 refs. [G.g.russ.e.]

[See *F.A.* 18 No. 614.] Reports studies carried out at Eberswalde in 1954–55, in the laboratory and field, with a critical discussion of other authors' observations. The species studied were Hazel, *Alnus glutinosa*, White and Black Poplar, Aspen, Willow (6 spp.), *Ulmus laevis*, Field Maple, Sycamore and Norway Maples, *Acer negundo*, Ash, Beech, Hornbeam, *Quercus robur*, *Q. sessiliflora*, *Q. borealis*, Robinia, *Cytisus scoparius*, *Prunus* (2 spp.), *Euonymus*, *Sorbus*, *Crataegus*, *Rosa* and Juniper. Branches were cut in the dormant stage and those carrying eggs were maintained in water through the flowering and fruiting stages for a study of the life history and type of damage done (illustrated in >60 drawings). Control by systemic poisons, possibly important in genetics and in seed-orchards, requires investigation. Successful spraying on a greenhouse scale has been carried out with E605 [parathion] and Wofatox.

4838. CAPECKI, Z. Epidemiczne opadanie szpilek sosny w lasach śląskich. [**An epidemic of needlecast on Scots Pine in Silesia.**] *Las Polski* 32 (7), 1958 (5–8). [Pol.]

Describes and illustrates damage caused to needles of new Pine shoots by the larvae of *Thecodiplosis brachyntera*, *Cecidomyia baeri*, and *Brachonyx pineti*.

Insects: Natural and Biological Control

See also Nos. 4834, 4850, 4855, 4858, 4860, 4863, 4865, 4867, 4874–5, 4880, 4892–7, 4899, 4901, 4921, 4935, 4938, 4941, 4942–3, 4945.

4839. GYÖRFI, J. Adatok a valódi fürkészdarázs-félék (fam. Ichneumonidae) gazdáinak ismeretéhez. **[Data on the hosts of Ichneumonidae.]** *Erdészettud. Közl., Sopron* 1958 (1), (119–31). 13 refs. [Hu.hu.russ.e.g.]

A list of 108 species with the hosts from which they were bred, 39 host species being entirely new records. The hosts include many forest pests, e.g. *Hyloicus pinastri, Panolis flammea, Rhyacionia buoliana.*

4840. NUNBERG, M., and WIĄCKOWSKI, S. Męczelkowate (Braconidae, Hymenoptera) jako pasożyty owadów leśnych. **[Braconidae as parasites of forest insects.]** *Folia for. polon.* (*Leśn.*) No. 1, 1958 (129–35). 7 refs. [Pol.russ.g.]

Gives the results of breeding experiments, listing the parasites bred, (*a*) by their host species, and (*b*) in systematic order.

Insects: Silvicultural Control

See Nos. 4834, 4879, 4924.

Insects: Chemical Control (General)

See also Nos. 4708, 4834–5, 4837, 4859, 4862, 4866, 4870–2, 4875–6, 4881–2, 4885–6, 4888–9, 4891, 4894–5, 4903, 4908, 4911, 4915–7, 4927, 4932–4, 4944, 4948.

4841. ZOEBELEIN, G. Zur Beeinflussung der Insektenfaune des Waldes durch chemische Grossschädlingsbekämpfungen. 2. Mitteilung. Untersuchungen bei der Bekämpfung des Kiefernspanners (*Bupalus piniarius* Z.) im oberbayrischen Forstamt Geisenfeld 1955. **[The influence of chemical insecticide treatments on the insect fauna of a forest. 2nd communication. Investigations in control operations against *B. piniarius*.]** *Z. angew. Ent.* 43 (4), 1958 (432–8). [G.g.e.] O.H.

[Cf. *F.A.* 19 No. 4470.] On ca. 2 ha. of a larger area, treated twice with 10% DDT fog (0·8 kg. DDT/ha.) at the end of July, mortality of *B. piniarius* and of *Cecidomyia* larvae (*C. brachyntera* and *C. baeri*) heavily infesting the site, was virtually 100%. Densities of most other insects declined considerably, but had more or less recovered by the 36th day. Parasitic wasps, living on the herb layer, were not much affected. The effect on the egg parasite *Trichogramma evanescens* could not be ascertained.

4842. BEYE, F., KAESER, W., and BUCHNER, R. Zur Wirkung von Aktivsubstanzen verschiedener Insektizide auf Bienen. **[The effect on bees of the active principles of different insecticides.]** *Anz. Schädlingsk.* 32 (3), 1959 (41–3). 4 refs. [G.]

Presents the results of tests for toxicity to bees of the pure active principles in 9 different well known insecticides.

4843. VANĚK, J. Změny v mezoedafonu lesních školek po použití HCH proti ponravám chroustů. **[Changes in the mesoedaphon of forest nurseries after BHC treatment against *Melolontha* larvae.]** *Sborn. čsl. Akad. zeměd.* (*Lesn.*) 5 (3), 1959 (337–46). 24 refs. [Cz.cz.russ.g.]

Changes in the mesofauna (Acarina, Diplopoda, Chilopoda, Apterygota, Diptera, Coleoptera) of several forest nurseries are tabulated, for periods up to 13 months after doses of 100, 300, 500 and 800 kg. BHC/ha. had been applied. The experiments were not on a large enough scale to draw generally valid conclusions.

4844. HABER, A. Wpływ arsenianów wapnia na płazy leśne. **[The influence of Ca arsenates on forest amphibia.]** *Prace Inst. bad. Leśn.* No. 188, 1959 (3–18). 6 refs. [Pol.pol.russ.e.]

Reports further investigations made during control operations against *Acantholyda nemoralis* [cf. *F.A.* 13 No. 3149; 17 No. 4143; 20 No. 758], this time on the effect of Ca arsenates on *Bufo* spp. (3), *Rana* spp. (2) and *Pelobates fuscus*. The chemicals, particularly in high concentrations, were harmful to tadpoles and the mature amphibia, the latter being more susceptible to contact than to internal poisoning. Larval mortality reaches 100% at concentrations of 15–20 mg. As_2O_5/litre of water.

Orthoptera

4845. CAN, E. Zur Kenntnis von *Isophya amplipennis* Br.v.W., *I. pavelii* Br.v.W., und *I. tenuicerca* Rme (Orth., Tettigoniidae) als Schädlinge von Eichenniederwäldern in Südosteuropa. **[*I. amplipennis*, *I. pavelii* and *I. tenuicerca* as pests of Oak coppice in S.E. Europe.]** *Z. angew. Ent.* 43 (4), 1958 (387–411). [G.] O.H.

Describes systematics, distribution, morphology and anatomy of these species, which in 1951–53 caused severe defoliations in East Thrace.

Isoptera

See also No. 4112.

4846. Recherche d'essences forestières résistantes aux termites. **[Research on forest species resistant to termites.]** *Rapp. Inst. nat. Étude agron. Congo belge 1957*, 1959 (493). [F.]

Eucalyptus cinerea planted on plots where *E. grandis* had been destroyed by termites showed 88·2% survival after 8 months; in another trial this species showed 86·9% survival after nearly 3 years. *Acrocarpus fraxinifolius* is also very resistant to termite attack (84·8% survival after 7 months).

4847. HARRIS, W. V. **Notes on termites injurious to forestry in British Honduras.** *Emp. For. Rev.* 38 (2), 1959 (181–5). 5 refs.

Records six species identified during a visit and describes the attack by *Coptotermes niger* on standing Pine (*Pinus caribaea*) and Mahogany (*Swietenia macrophylla*).

Thysanoptera

See No. 4866.

Hemiptera

See also No. 4835.

4848. FRANZ, J., and KARAFIAT, H. Eignen sich Kartierung und Serienphotographie von Tannenläusen für Massenwechselstudien? **[The suitability**

of serial plotting and photographs of Fir aphids for population studies.] *Z. angew. Ent.* 43 (1), 1958 (100–12). 11 refs. [G.e.] O.H.

A detailed refutation of the criticisms of Pschorn-Walcher and Zwölfer [cf. *F.A.* 20 No. 3415] including new photographs.

4849. SILVER, G. T. **The Balsam woolly aphid, *Adelges piceae* (Ratz.) in British Columbia.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 15 (1), 1959 (3).

The first authentic record of this aphid in British Columbia was reported in 1958 on *Abies amabilis* at 1400–3500 ft. alt. The infestation is believed to be ca. 8 years old and several infested trees are dead.

4850. CLARK, R. C., and BROWN, N. R. **Studies of predators of the Balsam woolly aphid, *Adelges piceae* (Ratz.) (Homoptera: Adelgidae). V. *Laricobius erichsonii* Rosen. (Coleoptera: Derodontidae), an introduced predator in Eastern Canada.** *Repr.* from *Canad. Ent.* 90 (11), 1958 (657–72). 14 refs.

L. erichsonii is one of several species introduced since 1933 into the Atlantic Provinces for the biological control of *A. piceae*. A history is given of liberations from 1951 to 1955, establishment and spread are reviewed, and information is given on the life history, habits and natural control of the predator. Population sampling methods for prey and predators are described. An analysis of predation by *L. erichsonii* shows that when the predator is present the normal upward trend from hiemosistentes to aestivosistentes prey generation was reversed. *L. erichsonii* is more effective than *Neoleucopis obscura* because the peak larval feeding period occurs at an earlier date and because the larvae destroy prey eggs. This has resulted in an almost complete loss of the aestivosistentes prey generation.

4851. FROST, F. **The Balsam woolly aphid and prescribed burning [with discussion].** *Publication, Newfoundland Research Committee, St. John's* No. 1, 1958 (19–35, 64–5 + 1 map, 1 gph., 2 photos). 9 refs.

Describes the spread of the infestation from 185 sq. miles, in 1949 (the first report from the island), to 2400 sq. miles in 1957, the damage to yield, pulpwood quality etc., and suggests promoting regeneration of the resistant Black Spruce in place of Balsam Fir by a system of clear felling and prescribed burning, leaving 10–20 Black Spruce trees per acre.

4852. ROBAK, H. Luseangrep på lerk. **[Aphid attack on Larch.]** *Medd. Vestland. forstl. Forsøksstа.* 10 (2), No. 32, 1959. pp. 36 + 1 dgm. 42 refs. [Nor.e.*e*.]

Reviews briefly literature from Germany, Switzerland, France, Great Britain and Scandinavia and describes observations on infestations by *Chermes viridanus*, chiefly on the Festingdal plot, Amla, Sogn (maximum infestation 1955) and on the Helgeland plot, Sandeid, Rogaland (maximum infestation so far 1957), both planted with *Larix decidua*, *L. leptolepis*, and *L. sibirica* as part of the international Larch provenance trials [cf. *F.A.* 20 No. 4764], with beating up with Dunkeld hybrid plants in 1950 after losses caused by the severe winter of 1946–47 and the dry hot summer of 1947. In both plots *L. leptolepis* and *L. sibirica* (one provenance of each) show low intensity of attack and little or no reduction of increment, and the hybrids show a lower % of trees attacked than *L. decidua* in the same squares, and negligible reduction in increment. *L. decidua* at Festingdal shows a close correlation between height increment in 1954–55 and 1956–57 expressed as % of the increment for 1952–53, and aphid infestation expressed as the % of heavily infested trees per sample plot. Because of the lack of replicates no definite conclusions can be drawn as to the relative susceptibility of different provenances. A fairly close positive correlation was found of intensity of infestation with density of stocking, probably as a result of competition for water and mineral salts, and a negative one with the % of hybrids used for beating up in a square, perhaps because the hybrids act as a barrier to aphid migration. The Helgeland plot was less thoroughly studied but results appeared to be similar. A study of rainfall and temperature measurements for the two districts and of observations by forest officers on infestations in Larch suggest that hot dry summers are not necessary for heavy aphid infestations, but that they do create favourable conditions.

4853. OHNESORGE, B. Die Massenvermehrung der Sitkalaus in Nordwestdeutschland. **[The outbreak of *Liosomaphis* (*Neomyzaphis*) *abietina* in N.W. Germany.]** *Forstarchiv* 30 (4/5), 1959 (73–8). 14 refs. [G.]

An account, from the literature and personal experience, of the systematics, biology, ecology, damage, population dynamics and control of *L. abietina*, an outbreak of which occurred in N.W. Germany in 1957, mainly on *Picea sitchensis*, but also on *P. abies*, *P. pungens* and *P. omorika* [cf. *F.A.* 20 No. 764]. In many cases older stands of *P. sitchensis* were destroyed; younger stands appear to have suffered heavy increment losses.

4854. HEINZE, K. Über einen Rindenlausbefall (*Stomaphis quercus* L.) an Birke. **[*S. quercus* attack on Birch.]** *Z. angew. Ent.* 43 (4), 1958 (415–7). 3 refs. [G.] O.H.

Describes observations in a Berlin arboretum on an Oak and a bomb-damaged Birch tree. While no direct injuries were observed, the ants (*Lasius fuliginosus*) attending the aphids appeared to cause some injury to the Birch by gnawing wood from exposed parts of the tree to build shelters for the aphids.

4855. GIFFORD, D. **A sarcoptiform mite apparently new to Britain.** *Ent. mon. Mag.* 95 (1136), 1959 (1). 4 refs.

The mite, *Hemisarcoptes malus*, was found feeding on the eggs of *Chionaspis salicis*, the scale attacking Ash in Perthshire. Remains of considerable infestations of *Lepidosaphes ulmi*, the usual hosts of the mite, but scarcely any living material, were also found on the Ash, a 20-year pole crop, which showed considerable die-back in the crowns.

Lepidoptera

See also Nos. 4834–5, 4839, 4841.

4856. RUPPERT, K., and LANGER, R. Die Raupen der Eiche im Frankfurter Stadtwald. **[Larvae attacking Oak in the Frankfurt city forest.]** *Anz. Schädlingsk.* 32 (3), 1959 (33–6). 7 refs. [G.g.]

Lists larvae found on both *Quercus robur* and *Q. sessiliflora* in the Frankfurt city forest over the years 1953–56 inclusive. 57 species were found from 12 families of Lepidoptera and 1 of Tenthredinidae. *Tortrix viridana* frequently constituted <50% of the larval population; it was nevertheless the species most frequently encountered, followed by *Operophtera brumata* and *Epinotia corticana* (hitherto not recorded for these forests), in that order.

4857. ROSS, D. A., and EVANS, D. **Annotated list of forest insects of British Columbia. Part III. *Eupithecia* spp. (Geometridae); Part IV. *Hydriomena* spp. (Geometridae); Part V. *Dioryctria* spp. (Pyralidae); Part VI. *Plusia* spp. (Noctuidae); Part VII. *Apatela* spp. (Noctuidae).** *Proceedings, Entomological Society of British Columbia, Vancouver* 52, 1956 (36–9); 53, 1957 (10–1); 54, 1957 (16–7, 18). 7 refs. I.I.E.

Cover respectively 35, 11, 7, 8 and 10 species, mostly leaf feeders of little or no economic importance, but also the cone-feeding species of *Dioryctria*. [Cf. *F.A.* 17 No. 1769.]

4858. SCHAFFNER, J. V., Jr. **Microlepidoptera and their parasites reared from field collections in the Northeastern United States.** *Misc. Publ. U.S. Dep. Agric.* No. 767, 1959. pp. 97. Price $0.35.

Consists mainly of a host/parasite list, showing food plants, distribution, parasites, etc. of the host, and a parasite/host list, showing hosts, location etc. of the parasites, both arranged by families.

4859. VASIĆ, M. Ogledi hemiskog suzbijanja velike topoline strižibube i staklokrilca. **[Experiments in the chemical control of *Saperda carcharias* and *Sciapteron tabaniforme*.]** *Topola, Beograd* No. 9, 1959 (767–75). 10 refs. [Serb.f.]

Preliminary experiments with 4 fumigant insecticides on each of 3 heavily infested Poplar trees showed that best and easiest control was given by injecting 1 c.c. of liquid CCl_4 into the larval galleries. Subsequent treatment of 54 trees confirmed the efficacy of the method.

4860. SCHNAIDER, Z. Z biologii przeziernika osowca (*Aegeria apiformis* Cl.). **[The biology of *A.* [*Sesia*] *apiformis*.]** *Prace Inst. bad. Leśn.* No. 190, 1959 (63–100). [Pol.russ.e.]

Gives full details of the biology, and some information on the few natural enemies and silvicultural significance, of *S. apiformis*, the larvae of which feed between the cambium and sapwood of Poplars.

4861. MARTIN, J. L. **The bionomics of the Pine bud moth, *Exoteleia dodecella* L. (Lepidoptera: Gelechiidae) in Ontario.** *Repr.* from *Canad. Ent.* 91 (1), 1959 (5–14). 7 refs.

Presents the results of observations begun in 1955 on the life history, habits, and present status of the species, first recorded in Ontario in 1928. Present distribution ranges throughout southern Ontario from the Bruce Peninsula in the W. to Ottawa in the E., and S. to the U.S. border. The preferred hosts are *Pinus sylvestris* and *P. mugo*, though in heavy infestations the pest is also found on other Pines. As attacks on young Scots Pine are not common, the Christmas tree industry is not threatened.

4862. LEMARIE, J. Druhý příspěvek k poznání bionomie makadlovky borové *Exoteleia* (*Heringia*) *dodecella* L. **[The bionomy of *E. dodecella*. II.]** *Zool. Listy, Brno* 7 (3), 1958 (208–20 + 2 plates). 10 refs. [Cz.cz.russ.g.] O.R.S.

Presents results of continued observations in 1957, describing the nature and extent of the damage and the successful control achieved by spraying shoot tips in April, 1956 with 1- and 2-% Nera emulsion (30% DDT).

4863. LEMARIE, J. Příspěvek k poznání cizopasníků makadlovky borové *Exoteleia* (*Heringia*) *dodecella* L. Část 1. **[The parasites of *E. dodecella* 1.]** *Zool. Listy, Brno* 7 (3), 1958 (221–30). 7 refs. [Cz.russ.g.] O.R.S.

Chalcidoidea, Proctotrupoidea and Bethyloidea. The most important parasites bred from pupae and larvae were *Copridosoma geniculatum*, *Cirrospilus pulcherrimus* and *Tetrastichus turionum*. Nine other parasites, less frequently found, are listed.

4864. BRADLEY, J. D. **A xyloryctid moth attacking the bark of the Rubber tree in Malaya.** *Bull. ent. Res.* 50 (1), 1959 (9–10).

Includes a re-description of *Deloryctis corticivora* Meyrick, a larval infestation of which has been reported feeding on the outer bark of *Hevea brasiliensis*. The bark of Ceylon Oak, *Schleichera trijuga*, is also eaten.

4865. SCHWENKE, W. Über die Standortabhängigkeit des Massenwechsels der Lärchenminiermotte, *Coleophora laricella* Hb., und der Ahorneule, *Acronycta aceris* L. **[The role of site in population fluctuations of *C. laricella* and *A. aceris*.]** *Beitr. Ent.* 8 (3/4), 1958 (241–90). 43 refs. [G.g.e. russ.] O.H.

Part I describes investigations on infestation and injury caused by *C. laricella* on 10- to 25-year Larch, mostly *Larix decidua*, on 22 sites between Berlin and Leipzig. It was heaviest on dry sandy sites and practically nil on riverain sites. Exposure to wind reduced, while exposure to light increased infestation, thereby complicating the effect of stand density. Incidence of infestation was about equal for *L. decidua* and *L. leptolepis*, but the same degree of infestation harmed *L. leptolepis* less. Part II reports on mortality factors observed during an outbreak of *Acronycta* (*Apatele*) *aceris* on Horse Chestnuts in Berlin back yards, as against Berlin parks, where infestation was not heavy, and on Oaks in the forest, where the insect was sporadic. Chief mortality factors were a virus disease and parasites. Parasitization was much greater in the forest and the park than in the artificial urban environment. [Cf. *F.A.* 20 No. 4892.]

4866. Ewald, G., and Burst, R. Untersuchungen über Lärchenblasenfuss und Lärchenminiermotte. **[Investigations on *Taeniothrips laricivorus* and *Coleophora laricella*.]** *Allg. Forst- u. Jagdztg.* 130 (6), 1959 (173–81). 31 refs. [G.g.e.]

Traces the development of populations, densities, injuries, etc., in relation to weather for the years 1954–56 in mixed young Larch stands in the Neckar region. The development of the thrips took from 28 to 41 days, involving a summated temperature (excluding all temperatures below 8°) of ca. 11,200° C. Degree of damage depended not only on thrips densities but on weather conditions as they affected the vigour and phenology of the trees. Larval counts on twigs suggested that for *C. laricella* 1·5 larvae per short shoot is the critical density for defoliation. Laboratory tests suggested that at least 20% may be deducted for winter mortality from values obtained in winter counts. Height growth of 45 infested trees in the years 1954–57 was significantly less than in 45 controls kept free of the moth by winter spraying with 0·9% DNC. Systemics [cf. *F.A.* 19 No. 675] were highly successful against both pests in small-scale tests, but are not considered practical for large-scale control. Of other methods of combined control, fogging with hand equipment is thought best, though timing is always difficult. While trees finishing height growth early suffered little from thrips, early flushing made them highly vulnerable to the moth. Silvicultural experience suggests planting Larch in groups, preferably on sites exposed to wind.

4867. Given, B. B. **Biological control factors influencing populations of Oak leaf-miner, *Lithocolletis messaniella* Zeller, in New Zealand including the introduction of parasites.** *N.Z. J. Agric. Res.* 2 (1), 1959 (124–33). 4 refs. O.R.E.

The seasonal population and mortality fluctuations of *L. messaniella* were determined, and the introduction to, and establishment in, New Zealand of its European parasites *Apanteles circumscriptus* and *Enaysma splendens* were studied. Though *A. circumscriptus* has established itself well in the Nelson district, the influence of the late-summer host mortality gives some cause for concern when considering ultimate control. As yet there is no indication of the establishment of *E. splendens*.

4868. Patočka, J. Beiträge zur Kenntnis des Tannenwicklers *Epinotia pusillana* (Peyerimhoff). **[Notes on *E. pusillana*.]** *Beitr. Ent.* 8 (3/4), 1958 (325–33). 11 refs. [G.g.e.russ.] O.H.

Reports its occurrence near Banska Stiavnica, Slovakia, on Silver Fir, and describes eggs, larvae and pupae, bionomics, feeding habits etc., in comparison with *E. proximana* and *E. tedella*. Though the insect was common, no damage of importance was observed.

4869. Peterson, L. O. T. **The Boxelder twig borer, *Proteoteras willingana* (Kearfott), (Lepidoptera: Olethreutidae).** *Repr.* from *Canad. Ent.* 90 (11), 1958 (639–46). 14 refs.

Observations on life history and habits and on natural mortality.

4870. Wachtendorf, W. Bemerkungen zur Lebensweise und Bekämpfung des Kieferntriebwicklers *Evetria* (*Rhyacionia*) *buoliana* Schiff. **[The mode of life and control of *R. buoliana*.]** *Anz. Schädlingsk.* 32 (4), 1959 (59–61). 8 refs. [G.g.]

Describes heavy outbreaks occurring in Bavaria in 1950–55, which were ended by high larval mortality in the cold winters of 1954–55 and 1955–56. In the course of trials in chemical control, begun in 1953, three insecticides were tested, Systox, Metasystox and Dipterex. Of these, Dipterex proved the most effective, though abnormal concentrations (0·5–1%) were necessary. Spraying must be done in the period August-November. Diesel oil is unsuitable as a carrier, since it does much damage to vegetation.

4871. Butcher, J. W., and Haynes, D. L. **Experiments with new insecticides for control of European Pine shoot moth [*Rhyacionia buoliana*].** *Quart. Bull. Mich. agric. Exp. Sta.* 41 (3), 1959 (734–44).

Heavily infested young Red Pines at Rose Lake and Mesick, Mich., were sprayed with different insecticides in spring and summer 1958. DDT, American Cyanamid 12880 and 18706, and Phosdrin gave best results (95–100% control) in spring. An attempt to evaluate 3 spreader-stickers added to 4 chemicals failed, since 3 of the chemicals performed well without them. The importance of proper timing of summer applications was illustrated. Spraying on June 24th gave uniformly poor results while on July 9th American Cyanamid 12880, Shell Chemical Co. SD4402, Phosphamidon, and DDT (both in water and in oil) all gave good control (80–100%), indicating that for successful control a toxic residue should persist on the plant throughout the late hatching period. The summer treatments were sampled by collecting 5 apparently injured or infested 2-in. shoot tips from the top of each plant and examining them under magnification.

4872. Knežević, I. *Semasia*—štetnik mladih topola. **[*Semasia*, a pest of young Poplars.]** *Topola, Beograd* No. 9, 1959 (776–8). 1 ref. [Serb.]

Describes damage to seedlings by *Semasia* spp. in a nursery near Osijek, Croatia, by larvae feeding on and killing the terminal bud, provoking a broom-like growth of several shoots from a lower bud. Spraying fortnightly in spring with lindane [γ BHC] and DDT did not give effective control, and silvicultural measures are recommended for the attacked plants.

4873. Acatay, A. *Melanophila decastigma* (= *picta* Pall.) und *Gypsonoma* (= *Semasia*) *dealbana* Froel. (= *incarnana* Hw.) in der Türkei. **[*M. decastigma* and *G. dealbana* in Turkey.]** *Anz. Schädlingsk.* 32 (5), 1959 (65–8). 4 refs. [G.]

M. decastigma attacks 3- to 25-year Poplar, and *G. dealbana* mainly young Poplar plants. Observations are presented on the damage they inflict and on their life history, and brief recommendations are made for their control.

4874. Baltensweiler, W. Zur Kenntnis der Parasiten des grauen Lärchenwicklers (*Zeiraphera griseana* Hübner) im Oberengadin. **[The parasites**

of *Semasia diniana* in the Upper Engadine [Grisons].] *Mitt. schweiz. Anst. forstl. Versuchsw.* 34 (6), 1958 (399–478 + 4 plates). 74 refs. [G.g.f.it.e.]

Describes and discusses 33 parasites bred during the period 1954–57, including 20 new for *S. diniana*, with special attention to the most important parasites of the Larch-feeding forms of the pest, whose parasite complex differs somewhat from that of those feeding on *Pinus cembra*. The parasites of species occurring in association with *S. diniana*, the very complex co- and super-parasitism relationships and the relative roles of certain parasites and of other factors affecting population density during the various phases of a population cycle were investigated. While at the height of the outbreak factors connected with over-population (virus disease etc.) were of the greatest importance, parasites reached their greatest effectiveness in the regression phase, when a *Phytodietus* sp. and species of the Eulophidae substantially reduced populations and delayed the onset of a new outbreak. *From author's summary.*

4875. KUDLER, J., and HOCHMUT, R. *Cacoecia crataegana* Hb. als derzeitiger Grossschädling in den mährischen Eichenbeständen. **[*C. crataegana* as a serious present-day pest of Moravian Oak stands.]** *Z. PflKrankh.* 66 (3), 1959 (142–9). 16 refs. [G. g.e.] E.M.B.

Describes the insect, its life history, the nature and extent of the damage (serious in 1957 when 1800 ha. of mixed Oak stands near Ölmutz were heavily or completely defoliated) and the progress of the current outbreak, and discusses parasites and diseases and the possibility of chemical control (so far only moderately successful in the limited experiments, using DDT fogs).

4876. Symposium: La tordeuse des bourgeons de l'épinette. **[Symposium on the Spruce budworm.]** *Texte Conf. 38e Assembl. ann. Corp. Ingén. for. Québec* 1958 (13–70). [E. or F.]

Includes papers and discussions on the following: Spruce budworm in Quebec 1939–1958 (*R. Martineau*; 24 refs. [F.]); Losses caused in Quebec forests by the present Spruce budworm outbreak (*R. Royer*; [F.]); Spruce budworm spraying in Gaspé (*A. Côté*, [E.]); and The ecology and management of Balsam Fir stands (*A. Lafond*; [F.]).

4877. BLAIS, J. R. **The vulnerability of Balsam Fir to Spruce budworm attack in Northwestern Ontario, with special reference to the physiological age of the tree.** *For. Chron.* 34 (4), 1958 (405–22). 7 refs.

The annual defoliation by Spruce budworm and the progressive mortality of Balsam Fir trees were recorded in 9 study plots over a period of 11 years. In addition to general observations on the relationship of tree mortality to defoliation, some information was obtained on the relative vulnerability of the trees with respect to size, physiological age (flowering condition) and vigour. The first trees to succumb were small, suppressed Balsam Fir (<3 in. d.b.h.); mortality of this advance growth began in the 3rd year of severe defoliation. Mortality of trees of merchantable size (⩾4 in. d.b.h.) generally started after 5 years of severe defoliation. Once initiated in a stand, tree mortality was rapid. In all the stands studied, 2 years was the maximum time required for mortality of merchantable trees to increase from 25 to 75%. Mortality of flowering trees occurred sooner than that of immature or non-flowering trees. The amount of cumulative defoliation required to cause specific %'s of tree mortality varied considerably between plots, and this could be attributed, at least in part, to site quality. Trees growing on a poor site offered less resistance to budworm defoliation than those growing on better sites. Balsam Fir growing in the immediate vicinity of broadleaved deciduous trees suffered less defoliation and survived longer than those growing under large mature Balsam Fir and White Spruce.

4878. REDMOND, D. R. **Mortality in rootlets in Balsam Fir defoliated by the Spruce budworm.** *For. Sci.* 5 (1), 1959 (64–9). 12 refs.

From sequential sampling [see *F.A.* 16 No. 4287] it is shown that when the defoliation of new shoots (*a*) was >70%, rootlet mortality (*b*) was >30%. When (*a*) reached 100, (*b*) soon exceeded 75. When, in young trees, (*a*) diminished or ceased, rootlets were immediately regenerated but such trees seemed unable to survive a recurrence of (*a*) severe enough to kill these new rootlets. Mature trees were less able, and overmature trees appeared unable, to regenerate rootlets after 4 or 5 successive years of total (*a*), though some new foliage was produced before death.

4879. THOMAS, J. B. **Mortality of White Spruce in the Lake Nipigon region of Ontario.** *For. Chron.* 34 (4), 1958 (393–404). 10 refs.

Most of the White Spruce (*Picea glauca*) in the area had been severely defoliated by the Spruce budworm for several years before mortality was first noticed. Survivors appeared to refoliate satisfactorily in the years immediately following the decline of the budworm outbreak in 1948, but dying White Spruce became noticeable again by 1951. Dead and dying trees examined in 1951–55 had been attacked by barkbeetles, chiefly *Dendroctonus piceaperda* and *Ips perturbatus*, which appeared to be the immediate cause of death. Both species are normally present in the forest in endemic numbers, only reaching epidemic levels when an abundance of breeding material is available (e.g. dead Balsam Fir, as in this case). Reports of damage to Spruce and Balsam Fir during the 19th century indicate a possible interrelationship of outbreaks of Spruce budworm and barkbeetles in the past. Analysis of growth data from the present affected area indicates that the least vigorous trees died first when Spruce budworm was most prevalent, and the most vigorous trees after defoliation ended and barkbeetles were more prevalent. This forced the beetles, if they were to spread, to attack more vigorous trees as time went by. The tendency for the beetles to attack larger trees in preference to smaller ones has been confirmed, and it is believed that this preference may act as a limiting factor in the spread of an outbreak, as the number of trees of the preferred size is reduced. At the same time, this characteristic of the beetle increases its destructive effect. It is concluded that outbreaks of *D. piceaperda* may be a natural development in a Spruce/Balsam Fir forest subjected to a severe outbreak of Spruce budworm. This should be taken into account in any plan formulated for the management of a forest of this type, and particularly in the salvage of trees from areas being attacked by the Spruce budworm.

4880. COPPEL, H. C. **Studies on dipterous parasites of the Spruce budworm, *Choristoneura fumiferana* (Clem.) Lepidoptera: Tortricidae. VI. *Phorocera incrassata* Smith (Diptera: Tachinidae).** *Canad. J. Zool.* 36 (4), 1958 (453–62). 8 refs. O.R.S.

The life history is described. No information is available on overwintering habits.

4881. WEBB, F. E., MACDONALD, D. R., and CAMERON, D. G. **Aerial spraying against Spruce budworm in New Brunswick—1958.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 15 (1), 1959 (1–2).

It is concluded that the outbreak is about to end and that the objects of 7 years' spraying have been largely achieved. Except for some relatively small patches, the threatened forest is still alive and growing, and there is little or no evidence of serious adverse effects of spraying on natural control of budworm.

4882. SECREST, J. P., and THORNTON, D. G. **A comparison of the toxicity of various insecticides to the Spruce budworm.** *J. econ. Ent.* 52 (2), 1959 (212–4). 6 refs.

Balsam Fir foliage was treated in a spray chamber regulating drop size and dosage at one gal./acre with (*a*) DDT at 1 lb./gal. oil (standard strength and rate in aerial spraying), BHC with and without extender, aldrin, dieldrin, and endrin (all at normal strengths); (*b*) the same at quarter normal strengths. In both (*a*) and (*b*), 4th- to 6th-instar larvae of *Choristoneura fumiferana* were set to feed one day previous to spraying. In weathering tests (*c*), the foliage was sprayed 3 days, or 1 or 2 weeks, before the larvae were set to feed. Natural mortality was counted in controls. DDT proved statistically superior in all tests.

4883. SILVER, G. T. **A method for sampling eggs of the black-headed budworm [*Peronea variana*].** *J. For.* 57 (3), 1959 (203–5). 5 refs.

A 10-in. branch sample unit is reliable for use in general surveys on *Tsuga heterophylla*. Five samples should be taken at random from the top third of the crown of each tree, and 3 trees sampled at each location. Caution must be used in predicting probable damage, because of the many variables involved.

4884. JÜTTNER, O. Ertragskundliche Untersuchungen in wicklergeschädigten Eichenbeständen. **[Yield studies in *Quercus robur* stands damaged by *Tortrix viridana*.]** *Forstarchiv* 30 (4/5), 1959 (78–83). 11 refs. [G.g.]

A more detailed account of work already noticed [see *F.A.* 20 No. 777].

4885. STEGER, O. Zur Eichenwicklerbekämpfung 1958 im Hochspessart. **[*Tortrix viridana* control in 1958 on Oak in Spessart.]** *Fortwiss. Cbl.* 78 (3/4), 1959 (108–20). 17 refs. [G.]

Preliminary trials with a mobile sprayer in 1957 showed that early treatment (before leaf-flush) with 1 kg. DDT active principle/ha. in 100 litres held some promise, and that late treatment (after leaf-flush) with 1 and 2 litres Dipterex emulsion/ha. in 100 litres of water gave a 99% kill. In 1958 early spraying was done by helicopter on 352 ha., and late spraying on 1188 ha., using 25 litres of 5% DDT-diesel oil solution/ha. in each case. Details are given of the methods used to decide upon the dates of spraying. Early spraying was a complete failure, because adequate coverage of the branches was not achieved. With late spraying, kills of 89–99% and 82–99% three days after spraying were noted in two forest districts. As regards failure of the acorn harvest, the critical egg density seems to be 200–400 eggs/1000 buds. Success in saving the current year's acorn crop can be achieved by late spraying only where egg counts show ≯1000 eggs/1000 buds.

4886. SILVA, J. DE AZEVEDO E. Notas acerca de la *Tortrix viridana* L. (Especial referencia a la determinación del 'período de combate' y economía de los métodos de tratamiento). **[Notes on *T. viridana* L., with special reference to determining the most effective control period, and economy of method.]** *Montes, Madrid* 15 (86), 1959 (155–64). 8 refs. [Span.]

From data based on 5 years' observations in *Quercus suber* and *Q. ilex* stands, it appears that after the date when 10% of the individuals in the stand have begun to flush, within a period of ca. 19 days, another 85% of the stand will have followed suit. The pest is at its most destructive stage from the emergence of larvae at the first date of flushing (10%) to the time when the first pupae appear, ca. 32 days later. The best time for chemical treatment, therefore, is the 13-day period following the date when 95% of the stand has flushed. The larvae are then in their 3rd and 4th instars, and at their most vulnerable. Slight modifications in the time of treatment may be introduced according to whether the progress of flushing is regular or irregular. Different methods of application are reviewed, and listed with an estimate of their cost and efficiency.

4887. **Mahogany shoot borer.** *Rep. W. Afr. Timb. Borer Res. Unit 1955/58*, 1959 (40).

In the Northern Territories, two main infestations of *Khaya senegalensis* by *Hypsipyla* sp. occurred, corresponding to the primary and secondary leaf-flush. Similar infestations were observed on *K. ivorensis* in southern Ghana.

4888. ENGLISH, L. L. **Control of the bagworm with Dibrom.** *J. econ. Ent.* 52 (2), 1959 (353).

Spraying with Dibrom (dimethyl 1,2 dibromo 2,2 dichloroethyl phosphate) as an emulsifiable concentrate (4 lb. Dibrom/gal.) under the name RE 435, at 1 and 2 pints/100 gal., gave 100% kills of *Thyridopteryx ephemeraeformis* when bags were 0·5 in. long. Completeness of kill depends on maturity of the insect, and residual action is short. There was no evidence of phytotoxicity in the Thuyas, Spruces and Junipers treated.

4889. HITCHCOCK, S. W. **The orange-striped Oakworm [*Anisota senatoria*].** *Circ. Conn. agric. Exp. Sta.* No. 204, 1958. pp. 8.

A description of the insect, of which an outbreak occurred in Connecticut in 1958, including life history, host plants other than Oak, damage and control. DDT (1 or 2 lb. DDT 50 wettable powder in 100 gal. water as a spray, or 1 gal. 25% emulsion in 6 gal. water in a mistblower) or Pb arsenate, are recommended.

4890. SMITH, C. C. **A note on the association of fall cankerworm (*Alsophila pometaria* (Harr.)) with winter moth (*Operophtera brumata* (Linn.)) (Lepidoptera: Geometridae).** *Repr.* from *Canad. Ent.* 90 (9), 1958 (538–40). 4 refs.

Describes similarities in the life history of these two species, which both feed to a great extent on the same trees. An interesting result of this close association is the winter moth's habit of laying its eggs in the empty shells of the previous generation of the cankerworm.

4891. MACELJSKI, M. Primjer uspješne lokalizacije dudovca. **[An instance of the successful localization of *Hyphantria cunea*.]** *Zašt. Bilja* No. 33, 1956 (89–93). (Croat.f.] I.M.I.

An outbreak of *H. cunea* at Zaprešić, near Zagreb, was successfully controlled in 1952 by destroying the nests of larvae and spraying 413 trees with a total of 180 kg. Pantakan (DDT) and 630 kg. Bentox (BHC); the population was reduced to negligible proportions for the next 3 years.

4892. MAYER, K. Die Parasiten und Krankheiten der Ahorneule (*Acronicta aceris* L.). **[Parasites and diseases of *A. aceris*.]** *Anz. Schädlingsk.* 32 (2), 1959 (18–21). 6 refs. [G.]

Observations on parasites and a bacterial disease of *A. aceris* infesting Maple and Horse Chestnut in the Berlin Tiergarten. [Cf. *F.A.* 20 No. 4865.]

4893. ANDROIĆ, M. Pojava bakterioze kod zlatokraja i njeno značenje za gustoću populacije 1958 god. **[Bacterial infection of *Euproctis phaeorrhoea* and its significance for population density in 1958.]** *Šum. List* 83 (1/3), 1959 (50–2). [Croat.f.]

Describes the infection, observed both in the laboratory and in nature in the Karlovac and Popovač regions of Croatia. Its pathogenic effect did not develop until 15–20 days after infection of the larvae, and it is unlikely to reduce their numbers substantially over large areas.

4894. SCHNAIDEROWA, J. Z badań nad białką wierzbówką (*Leucoma salicis* L.). **[Studies on *L. salicis*.]** *Prace Inst. bad. Leśn.* No. 189, 1959 (19–62 + 1 dgm.). 90 refs. [Pol.russ.e.]

Gives details of morphology, outbreaks in Europe, distribution, biology, parasites and predators, and laboratory trials of chemical control. DDT and BHC are useful against the younger instars, but their effectiveness, particularly that of BHC, declines with older instars. Chemical control should be restricted to nurseries, and heavily infested plantations recovering from attacks in the previous year; insectivorous birds should be encouraged in threatened areas.

4895. Gubar. Rezultati rada na njegovom proučavanju i suzbijanju kod nas u toku 1957 godine. **[*Lymantria dispar*. Results of work on its study and control in Jugoslavia in 1957.]** *Zašt. Bilja* No. 41/42, 1958. pp. 155. [Serb.serb.e.] I.M.I.

Contains 16 papers by different authors on *L. dispar*, its ecology, parasites, diseases, population dynamics and control, and also: The effect of temperature on diapause (*M. Maksimović*); The effect of temperature variations on polyhedrosis (*L. Vasiljević*); The trap method of control (*M. Maksimović*); The effect of some effective insecticides on the forest biocoenosis (*K. Vasić*, and *L. Janković*); and The effect of abiotic factors on the development of *L. dispar* (*M. Maksimović*). Limited distribution.

4896. HEITOR, F. P. COELHO. Contribuição para o estudo comparativo das viroses de dois insectos. **[A comparative study of the viruses of two insects.]** *Estud. Inform. Serv. flor. aqüic. Portugal* No. 105-*H*3, 1959. pp. 38 + 2 plates. 28 refs. [Port.port.f.] Limited distribution.

Observations in the laboratory indicated that the virus attacking *Lymantria dispar* is distinct from that attacking *Bombyx mori* and that the viruses are probably specific to these insects.

4897. SILVA, F. DE P. V. DE AZEVEDO E. Luta biológica contra os insectos nocivos florestais em Portugal. **[Biological control of forest pests in Portugal.]** *Estud. Inform. Serv. flor. aqüic. Portugal* No. 106-*H*3, 1959. pp. 15. 3 refs. [Port.port.e.] Limited distribution.

A brief review of Portugese work. *Lymantria dispar* is the only pest subjected to such measures in Portugal, and attempts have now been abandoned largely because of the cost. Parasites and predators of *L. dispar* are listed with brief biological notes.

4898. **Gypsy moth [*Lymantria dispar*]: larval rearing, disease studies, effects of gamma radiation.** *Rep. Ntheast. For. Exp. Sta. 1958*, 1959 (31–3, 34–5).

Notes are given on larval rearing, and on studies of disease. Gamma radiation at different dosages was applied to ♂ and ♀ pupae of 3 age classes, and irradiated moths were subsequently reared. Exposure to 20,000-R units resulted in nearly complete egg mortality and it also decreased adult emergence, increased the number of adults with structural abnormalities, and sharply reduced mating success. The study will be continued to show the effect of radiation on chromosomes and genes of successive generations.

4899. JANISCH, E. Populationsanalyse an Schadinsekten. **[Population analysis of injurious insects.]** *Z. angew. Ent.* 43 (4), 1958 (371–86). 27 refs. [G.g.e.] O.H.

Illustrates, chiefly by reference to experiments with *Lymantria monacha*, the effect of mortality factors (mainly bacterioses and viroses) on the development of populations (including the diagnostic value of age distribution etc.), the selective eugenic effect of diseases and, similarly, of badly timed control operations, etc. [cf. Janisch, *F.A.* 7 p. 132].

4900. ROMANYK, N. Die Nonne (*Lymantria monacha* L.) in Spanien. [***L. monacha* in Spain.**] *Z. angew. Ent.* 43 (3), 1958 (336–8). [G.g.e.] O.H.

Briefly describes development of infestations (following roughly a 15-year cycle) since 1920, their distribution (3 main areas in the central mountains, at 1000–2000 m.alt.), extent (ca. 60,000 ha. in 1952–56), and control [cf. *F.A.* 15 No. 486]. In addition to *Pinus sylvestris*, *P. pinaster* was also attacked, but not *P. nigra* var. *calabrica*.

4901. GRISON, P., VAGO, C., and MAURY, R. La lutte contre la processionaire du pin, *Thaumetopoea pityocampa* Schiff., dans le massif du Ventoux: essai d'utilisation pratique d'un virus spécifique. [**The control of *T. pityocampa* on Mt. Ventoux: and an experiment in the use of a specific virus.**] *Rev. for. franç.* 11 (5), 1959 (353–70). 9 refs. [F.]

The success of the large-scale afforestation of Mt. Ventoux is threatened by infestations of the Pine processionary moth, and a large-scale experiment has been made in control by a polyhedral disease [cf. *F.A.* 17 No. 4194]. Concentrated suspensions of the virus, obtained from large-scale laboratory cultures, were reduced to powder form, mixed with bentonite and disseminated by helicopter on 1, 2, 3, and 5 Oct. 1958. Repeated observations, including microscopic examination of larvae from the treated and control areas, disclosed fatal effects around 10 Nov., or ca. 6 weeks after treatment, among 3rd-instar larvae, i.e. in those that were the youngest at the time of the operation. By 3 Dec., 80·25% of larvae in the treated areas were infected with virus disease against 8·3% in the control areas; by 12 Feb. 1959 the corresponding figures were 85·45 and 11·35.

4902. ANDROIĆ, M. Borov četnjak gnjezdar (*Cnethocampa pityocampa* Schiff.). Biološko-ekološka studija. [***Thaumetopoea pityocampa*. A biological and ecological study.**] *Glasn. šumske Pokuse* No. 13, 1957 (351–447 + 4 tbls.). 124 refs. [Croat.f.*f.*]

A detailed account, with sections on systematics and morphology, biology, distribution and ecology, based on studies in Jugoslavia, where *T. pityocampa* is a serious pest of Pine, particularly *P. nigra*.

Coleoptera

See also Nos. 4113–5, 4173–4, 4834, 4838, 4843, 4879, 4953, 5306.

4903. WILLIAMS, R. E., and NEISWANDER, R. B. **Investigations on the control of the bronze Birch borer [*Agrilus anxius*] and the flatheaded Apple tree borer [*Chrysobothris femorata*].** *J. econ. Ent.* 52 (2), 1959 (255–7). 34 refs.

These buprestids are serious pests, particularly of ornamentals, *A. anxius* (*a*) on Birches and Poplars and *C. femorata* (*b*) on a wide host range. Of several organo-phosphates tried, parathion, 25% emulsifiable concentrate at 1 gal./100 gal. or 15% wettable powder at 6·7 lb./100 gal. was consistently effective against (*a*) on Birches and against (*b*) on Maples, Birch, and Honey Locust. Results with DDT were erratic but a strong concentration with latex or polyethylene on the stems of newly transplanted shade trees may be adequate against (*b*).

4904. DOMINIK, J. Wykarczak (*Criocephalus rusticus* L., Cerambycidae, Coleoptera) biologia, zapobieganie szkodom i zwalczanie. [***C. rusticus* biology, damage prevention, and control.**] *Folia for. polon.* (*Leśn.*) No. 1, 1958 (45–127). 55 refs. [Pol.russ.g.]

A full account of the insect, which is a serious secondary pest of Scots Pine in Poland, and of its control.

4905. **Red Oak borer—primary enemy of our upland Oak.** *Rep. Cent. St. For. Exp. Sta. 1958*, [1959] (19–20).

In the light of new findings, *Romaleum rufulum* appears to be the most important borer damaging wood of Black, Scarlet and Red Oaks, as the newly hatched larvae can bore directly through the bark to the living tissue, whereas <1% of newly hatched *Prionystus robiniae* larvae can do so; these are frequently found in holes made by the former. *R. rufulum* holes were also invaded in late spring by larvae of sap-feeding beetles, chiefly *Glischrochilus quadrisignatus*, creating a soured sap medium that killed about half the surviving borer population. This combined attack gives rise to a bark pocket defect, i.e. ingrown bark-callus tissue 1–3 in. in diam. with associated wood stain.

4906. ***Tetropium gabrieli* (Weise) (Col. Cerambycidae) in Dorsetshire.** *Ent. mon. Mag.* 95 (1137), 1959 (43).

A first record for the county from Bere Wood, near Bere Regis. The insect was breeding not in Larch, the preferred host, but in Pine.

4907. CHÊNG, H.-Y., and HSÜ, T.-S. [**On the life history and control measures of the acorn weevil *Curculio* (*Balaninus*) *dentipes* (Roelofs).**] *For. Sci., Peking* 1959 (1), (68–76). 17 refs. [Chin.e.]

The weevil, a serious pest on the fruits of *Castanea mollissima*, *Quercus acutissima*, *Q. variabilis* etc. is widely distributed in China. Control was obtained by immersion in hot water (5 minutes at 60° C., 10 at 55°, 15 at 50° or 30 at 45°) or fumigation with CS_2 (> 22 c.c./cu.m. for 20 hours at > 23°). These treatments did not affect acorn germination. *From authors' summary.*

4908. FRANCKE-GROSMANN, H. Versuche zur chemischen Bekämpfung der Junglarven des *Cryptorrhynchus lapathi* L. in Weidenkulturen. [**Chemical control of young larvae of *C. lapathi* in Osier beds.**] *Repr.* from *Mededelingen van de Landbouwhogeschool en de Opzoekingsstations van de Staat te Gent* 23 (3/4), 1958 (678–84). 2 refs. [G.]

Of 4 preparations tested in the spring at varying concentrations and dosages against overwintering larvae in stoolbeds near Hamburg, Nexit-γ-emulsion

0·5% at 40 or 20 litres per 80-m. row, and Oktanex (endrin-type) 5% at 40 litres gave best results, i.e. >90% kills. Overwintering beetles were not killed.

4909. STARK, R. W. ***Hylobius warreni* Wood in Alberta.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 15 (2), 1959 (2).

The weevil was found to be widely distributed throughout the province. Its primary host is *Pinus contorta* var. *latifolia*, but it was also collected from *Picea glauca*, *Abies lasiocarpa* and *Larix* spp. No tree mortality due to *H. warreni* attack was observed, though as many as 24 larvae were found in the roots and root collar of one tree.

4910. SULLIVAN, C. R. **White Pine weevil.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 15 (2), 1959 (1).

Study of the feeding and oviposition of *Pissodes strobi* on White Pine (*a*) in open stands and (*b*) overtopped by hardwoods, shows that the reduced weevil attack and development in (*b*) is partly due to lack of light: the weevils tend to progress upwards in open-grown trees and lay their eggs on leading shoots, whereas in shaded trees they disperse and the emerging larvae are unable to aggregate, which is necessary to their survival. The weevils also show a preference for the largest leading shoots: weevil attack in one case increased from zero among leaders of 4 mm. diam. to 80% among leaders of 9 mm. diam.

4911. SCHINDLER, U. Der mittlere schwarze Rüsselkäfer (*Otiorrhynchus niger* F.). [***O. niger***.] *Repr.* from *Zeitschrift für angewandte Zoologie, Berlin* 45 (3), 1958 (257–313). 78 refs. [G.g.e.]

A monograph based on literature, unpublished observations in Germany, and the author's own researches in the Harz mountains, covering distribution, taxonomy, bionomics, habits, enemies, economic importance and control. Adults frequently preferred the foliage of Douglas Fir, Alder and Birch to their usual host plant, Spruce. Feeding experiments indicated an annual intake of 0·75 g. of needles per beetle. Contrary to literature reports, no feeding on the bark of root collars was observed. Injuries caused by adults are negligible, but the larvae are considered the most serious pest of nurseries in the Harz mountains and are highly resistant to most insecticides. Dusting with 4 kg. lindane (= 60 g. γ isomer) per are before planting prevented infestation. Soil injections with lindane or parathion emulsions between plant rows required twice the concentration recommended for cockchafer larvae, to be effective. Control of adults with DDT (0·5% solutions of preparations having 50% active principle) sprayed in and round the nursery at the time of emergence from hibernation (end of April) is recommended as effective and comparatively cheap.

4912. THOMPSON, R. T. ***Polydrusus impar* (Gozis) (Col., Curculionidae) in Britain.** *Ent. mon. Mag.* 95 (1136), 1959 (15). 2 refs.

The insect is reported from Sitka Spruce in Rockingham forest, Northants. It occurs commonly in the mountains of France and Central Europe on *Picea abies* and *Pinus sylvestris*, whence it has spread to conifer plantations in the Seine basin.

4913. CHARARAS, C. Les variations de la pression osmotique des conifères, facteur déterminant la pénétration des Scolytidae (insectes coléoptères). **[Variations of osmotic pressure in conifers, as a factor determining penetration by Scolytidae.]** *C.R. Acad. Sci., Paris* 249 (9), 1959 (1407–10). [F.] O.R.S.

Two sets of graphs are given showing osmotic pressures in bark, wood and needles of branches of *Pinus sylvestris* and *Picea abies*. For both species, low pressures were associated with heavy attacks by Scolytidae. Pressures were found to range from 7·787 to 9·815 atm. in the bark, 2·966 to 5·423 in the wood and 15·823 to 19·192 in the needles. Measurements on a large number of samples showed that *Ips typographus* attacked a sample having bark pressure of 8 atm. in 48 hr. and one having a pressure of 5·5 atm. in only 7 hr., but failed to attack samples with bark pressures >9 atm. *Hylurgops palliatus* attacked branches only when bark pressures were in the range 3–5 atm., i.e. in dying trees. Wounding a growing Pine at a height of 30 cm. reduced the bark pressure from 13·098 to 10·665 atm. at a height of 4 m.

4914. DÄSSLER, H.-G., and HENKER, W. Über Lockstoffe beim grossen Kiefernborkenkäfer (*Ips sexdentatus*). **[Attractants of *I. sexdentatus*.]** *Anz. Schädlingsk.* 32 (5), 1959 (74–6). 6 refs. [G.g.]

The following substances were tested for their attractiveness to *I. sexdentatus*; (1) some aliphatic aldehydes and ketones, (2) some esters of fatty acids, and (3) terpenes present in turpentine from Pine resin, viz. *d*-α-pinene, β pinene, Δ^3 carene, dipentene and camphene. Of (1), propionaldehyde and acetone diluted to 10^{-2} proved to have attractant properties; of (2), esters of the higher saturated and unsaturated fatty acids had none, while the ethyl esters of oleic and linoleic acids at dilutions of 10^{-4} gave varying results; of (3), both dipentene and camphene proved strongly attractive, especially dilutions of dipentene between 10^{-2} and 10^{-6}, and of camphene between 10^{-2} and 10^{-4}.

4915. RÜHM, W. Zur mechanisch-chemischen und ökologischen Bekämpfung des Riesenbastkäfers *Dendroctonus micans*. **[Mechanical-chemical and ecological control of *D. micans*.]** *Repr.* from *Z. angew. Ent.* 43 (3), 1958 (286–325). 30 refs. [G.g.e.]

Discusses the reasons (water shortage, game damage, smoke injury etc.) for the dangerous increase of this pest in Schleswig-Holstein, chiefly on *Picea sitchensis*, and control measures successfully tried in two forests in Flensburg. [Cf. *F.A.* 18 No. 4341.]

4916. LYON, R. L. **Toxicity of several residual-type insecticides to selected Western bark beetles.** *J. econ. Ent.* 52 (2), 1959 (323–7). 4 refs.

Reports further studies in search of less costly, more reliable control [cf. *F.A.* 19 No. 2075]. Applications (technique detailed) were made of (*a*) endrin, (*b*) isodrin, (*c*) EPN, (*d*) lindane, (*e*) dieldrin, (*f*) heptachlor, (*g*) DNC and (*h*) DDT to (1) *Dendroctonus brevicomis*, (2) *D. monticolae*, (3) *Scolytus ventralis* and (4) *Melanophila californica* at 0·16 µl./mg. *individual* body weight. A generalized order (*A*) of toxicity is (*b*), (*a*), (*d*), and (*c*) > (*e*) > (*f*) and (*g*) > (*h*); (*B*) of increasing tolerance of these insects at 90% of the lethal dose is (3) < (2) < (1) = (4). The effect of the greater toxicity of heptachlor to the ♂ of *D. monticolae* and of DNC to the ♀ of *D. brevicomis* on the order of potency of these insecticides for purposes of control is also discussed.

4917. Lyon, R. L. **Lindane. A better insecticide for Pine engraver beetles.** *Misc. Pap. Calif. For. Range Exp. Sta.* No. 29, 1959. pp. 2.

Laboratory and small-scale simulated field studies showed that sprays of lindane in kerosene formed very small crystals on the bark, which proved highly toxic to the beetles (critical factors being the shape and size of the crystals) even at a rate of 0·0001 oz. lindane/sq. ft. of bark. As the amounts needed are very low, it is estimated that material costs can be cut by 50 to 90% of those for penetrating sprays like $C_2H_4Br_2$, as also costs of labour and transport. [Cf. *F.A.* 10 No. 4466.]

4918. Nosek, J. Beitrag zur Biozönologie der Borkenkäfer südslovakischer Eichenwälder. **[The biocoenology of barkbeetles in Oak forests of S. Slovakia.]** *Schweiz. Z. Forstw.* 110 (2), 1959 (85–8). 9 refs. [G.f.]

Describes the barkbeetles and other primary and secondary pests of Oaks and species associated with them in the forests of the Danube plain and the S. Slovakian forest-steppe, with a list of occurrence and relative abundance of 48 species in 4 localities.

4919. Chararas, C. Observations sur la biologie de *Leperesinus fraxini* Panz. (Col. Scolytidae). **[The biology of *Hylesinus fraxini*.]** *Rev. Path. vég.* 27 (3), 1958 (199–216). 15 refs. [F.f.g.] I.M.I.

Presents the results of observations made in the laboratory and in the Haute Savoie. A special study of the influence of high and low temperatures on larvae and adults showed that, in nature, extremes of temperature (<20° and >55° C.) can cause extensive mortality. *From author's summary.*

4920. Michalski, J., and Witkowski, Z. Obserwacje nad szkodliwością żeru uzupełniającego i regeneracyjnego *Blastophagus piniperda* L. (Coleoptera. Scolytidae) w drzewostanie sosnowym I klasy wieku. **[Observations on the feeding damage of *B. piniperda* in age-class I Pine stands.]** *Sylwan* 103 (2), 1959 (45–59). 11 refs. [Pol.russ.e.]

B. piniperda, spreading from a timberyard into the adjacent part of a 20-year Pine plantation, caused severe damage in 1953–5. Statistically treated comparisons of attacked and untouched parts of the stand showed diam., height and volume increment in the former to be reduced by 32·4, 27·5 and 30·2% respectively. Crown and shoot deformations are also illustrated.

4921. Bekander, B. Der doppeläugige Fichtenbastkäfer *Polygraphus polygraphus* L. **[*P. polygraphus*.]** *Medd. SkogsforsknInst., Stockh.* 48 (9), 1959. pp. 127. 99 refs. [G.g.sw.]

A monograph, discussing systematics, morphology, anatomy, biology, ecology and enemies in Sweden, on the basis of investigations in S.E. Sweden during an outbreak in 1955 and 1956, after a severe drought. The beetles preferred weakened Spruce trees, irrespective of size and position in the stand. They could locate and reach suitable brood trees over a distance of 1 km. Woodpeckers killed 80–90% of the populations in winter and were more important than parasites as a natural check. Felled trap-trees were not attacked by the beetles, and trees artificially weakened, e.g. by girdling, were only attacked in the second season, after having been colonized by other barkbeetles. Felling and barking of infested or other weak trees plus good silviculture are considered the best safeguards. *From author's summary.*

4922. Nishiguchi, C. **[Barkbeetles attacking Pine.]** *Misc. Inform. Tokyo Univ. For.* No. 12, 1957 (69–73). [Jap.]

Lists beetles [scientific names in roman] found at various stem heights on (*a*) one *Pinus strobus*, (*b*) two *P. koraiensis*, (*c*) one *P. sylvestris* and (*d*) one *P. ponderosa*. The following are listed as chief pests: *Ips cembrae* chiefly on (*a*), *I. typographus* f. *japonicus* (*b*) and (*d*), *Myelophilus piniperda* (*c*), *Pityogenes chalcographus* (*a*), *Cryphalus laricis* (*b*) and (*c*), and *Pissodes nitidus* (*c*).

4923. Nishiguchi, C. **[Barkbeetles attacking Douglas Fir.]** *Misc. Inform. Tokyo Univ. For.* No. 12, 1957 (75–8). [Jap.]

Lists beetles [scientific names in roman] found on various parts of the stems of 9 Douglas Fir, chiefly *Cryphalus laricis*, *Ips typographus* f. *japonicus*, *Pityogenes chalcographus* and *Polygraphus* spp.

4924. Stevens, R. E. **'What's wrong with my trees?' Douglas-Fir damaged by engraver beetles.** *Misc. Pap. Calif. For. Range Exp. Sta.* No. 30, 1959. pp. 2.

An outbreak of *Scolytus unispinosus* killing young Douglas in stands in N.W. California was observed in 1958; against this background a brief account is given of the type of damage by *S. unispinosus*, causes of outbreak, and silvicultural measures for reducing the population.

4925. Schedl, K. E. **A new scolytid species and new host records of some Malayan Scolytidae and Platypodidae.** *Malay. Forester* 22 (2), 1959 (167–9).

Describes *Stephanoderes dimorphus* sp.nov. found boring into young shoots of *Acacia auriculaeformis*.

4926. Kalshoven, L. G. E. **The occurrence of the primary twig borer *Xyleborus morstatti* Hag. in Indonesia. (Studies on the biology of Indonesian Scolytoidea, Nr. 3).** *Repr.* from *Entomologische Berichten, Amsterdam* 18, 1958 (220–30, 244–59). 26 refs. [E.] P.R.

Part I discusses first data and recognition in 1920 of the occurrence and spread of *X. morstatti* in

Sumatra, E., W. and Central Java, Celebes and Borneo, and the habits of this twig-borer compared with those of *X. morigerus*. Part II discusses cases of dieback arising from infestation of *Eusideroxylon zwageri* seedlings in S. Sumatra and of *Erythroxylon novagranatense* in W. Java.

4927. Dominik, J. Z doświadczeń nad chemicznym zwalczaniem w drewnie drwalnika (*Trypodendron lineatum* Ol.), nieparka pospolitego (*Xyleborus dispar* F.), drwalniczka Saxesena (*Xyleborinus saxeseni* Ratz.), i rytla pospolitego (*Hylecoetus dermestoides* L.). **[The chemical control of *T. lineatum*, *X. dispar*, *X. saxeseni* and *H. dermestoides* in wood.]** *Sylwan* 103 (1), 1959 (1–9). 2 refs. [Pol.russ.e.]

Gives details of the effect of some or all of 6 chemical preparations used as thick coatings (*a*) on trap trees of unbarked Pine and Spruce, and barked Pine, against *T. lineatum*; (*b*) on Oak poles against *X. dispar* and *X. saxeseni*; (*c*) on barked and unbarked Oak and Beech against *H. dermestoides*. Generally good control was obtained.

4928. Kinghorn, J. M., and Chapman, J. A. **The overwintering of the ambrosia beetle *Trypodendron lineatum* (Oliv.).** *For. Sci.* 5 (1), 1959 (81–92). 14 refs.

[Cf. *F.A.* 20 No. 3504.] Unlike most of the ambrosia beetles, *T. lineatum* overwinters in the forest duff. This detailed study, carried out in coastal forest in British Columbia, covers sampling techniques, the distribution of hibernating beetles (flight on emergence, depth distribution in duff, relation to standing trees and forest margins), overwintering duration and mortality. The study is a contribution toward a sampling method applicable to the relatively long overwintering period when populations are stationary.

4929. **Seasonal variation in populations [of ambrosia beetles]; movement of beetles; life history studies.** *Rep. W. Afr. Timb. Borer Res. Unit 1955/58*, 1959 (11, 17–28).

Results of detailed studies include the following: some variation in populations of a given species on the wing was found between the wet and dry season; the direction of incident light beneath the canopy may be significant in determining directional flight; beetles are either crepuscular or entirely nocturnal or fly at single limited periods during the day; some correlation between flight activity and physical factors of the environment has been established, and saturation deficit appears to be an important factor; gallery patterns are generally peculiar to a species, and the depth of radial penetration is generally constant, the smaller species (mainly Scolytidae) penetrating significantly less deeply than the larger Platypodidae; it is possible to decide from the presence or absence of tarsi and the condition of the setal covering of the thorax and abdomen whether an imago has already established a gallery or is newly emerged.

4930. **[Ambrosia beetle attack on living *Khaya ivorensis*.]** *Rep. For. Dep. Ghana 1955/56*, 1958 (25).

Young *K. ivorensis* in line plantings for the enrichment of dense tropical forest in Subri Forest Reserve were killed by ambrosia-beetle attack after trees adjacent to the planting lines had been poisoned with Na arsenite in order to give the planted trees more light. It is supposed that very high populations built up in the poisoned trees [cf. *F.A.* 19 No. 2073], and that population pressure caused the transfer of the attack to the young *K. ivorensis*.

4931. **Infestation [by ambrosia beetles] of [poisoned] standing trees.** *Rep. W. Afr. Timb. Borer Res. Unit 1955/58*, 1959 (29 + 1 photo).

[Cf. *F.A.* 19 No. 2073.] Considerable variation was found in susceptibility to poisoning of tree species, e.g. *Cleidion gabonicum*, *Hymenostegia afzelii* and *Trichilia heudelotii* showed signs of dying a few days after girdling and treatment with Na arsenite, whereas *Triplochiton scleroxylon* and *Cylicodiscus gabunensis* took several months to succumb. This degree of susceptibility was reflected in the intensity of beetle attack for the first few weeks after treatment. Over a longer period no such correlation was found, but the rate of spread of infestation along the bole and lower branches was indicative of the range and spread of action of the Na arsenite. Growth-regulator arboricides applied as a spray-band round the bole proved unsatisfactory on very large trees, but on smaller trees death was rapid and heavy beetle infestation occurred. A correlation was again found, in the first weeks after treatment, between intensity of attack and the speed with which the trees succumbed. Generally trees treated in this way were less heavily infested than the arsenite-poisoned ones, possibly because of the absence of exposed sapwood in girdling cuts.

4932. Moore, G. Las larvas del 'bicho torito' (*Diloboderus abderus*) pueden resultar una temible plaga forestal. **[Larvae of *D. abderus* can constitute a formidable forest pest.]** *Rev. for. argent.* 3 (1), 1959 (10–2). [Span.]

A plantation of *Pinus radiata* was established in Buenos Aires province in the winter of 1958 on land previously carrying wheat. In September of the same year, severe damage was caused to the root collar of plants and the stem up to 3 cm. above soil level by larvae of *D. abderus*. Spraying with heptachlor at 4·7 kg. active substance in 675 litres water/ha., followed by disk harrowing between the rows, successfully controlled the outbreak.

4933. Dominik, J. Próba zwalczania dwuletniego pędraka chrabąszcza majowego (*Melolontha melolontha* L.) przez dwukrotne traktowanie gleby preparatem 'Intox 8'. **[Trials in destroying 2-year-old *M. melolontha* larvae by dusting the soil twice with Intox 8.]** *Zesz. nauk. Szkol. Gospod. wiejsk. Warsz.* (*Leśn.*) No. 1, 1958 (77–82). 2 refs. [Pol.e.]

Application of 2 kg./are in the first summer, and of 4 kg./are in the second, gave adequate protection to Pine seedlings. [Cf. *F.A.* 16 No. 2007.]

4934. Brammanis, L. Bidrag till kännedomen om för skogen skadliga bladhorningar i Sverige. III. Brunborren, *Serica brunnea* L. **[Lamellicorn**

beetles injurious to forests in Sweden. III. *S. brunnea*.] *Medd. SkogsforsknInst., Stockh.* 48 (7), 1959. pp. 46. 59 refs. [Sw.sw.g.*g*.]

Discusses, on the basis of the literature and the author's own investigations, the systematics, distribution, morphology, biology and ecology, injuries, and control of this insect [cf. *F.A.* 18 No. 1915]. In Sweden the generation was uniformly triennial. Grassy, slightly shaded spots were preferred for breeding, very dry, poor sites and conifer stands being avoided. Damage is mainly to Spruce in forest nurseries, through gnawing of the bark of roots, and usually occurs in patches. Control through removal of grassy strips near nurseries, e.g. by ploughing in the flight season, and treatment of the beds with 10–15 g. BHC/sq.m. before sowing or planting are recommended. Later applications between plant rows (10 g./sq.m.) were only 50–60% successful and Allfox [a liquid lindane/BHC preparation], at 4 litres/sq.m. in a 1/500 concentration, even less so. However, these partially treated plots had markedly fewer newly hatched larvae than controls. *From author's summary.*

Hymenoptera

See also Nos. 4116, 4844, 4854, 4856.

4935. PISKORZ, M. Osnujka świerkowa. [***Cephaleia abietis***.] *Las Polski* 32 (6), 1958 (4–6). [Pol.]

Life history, damage, methods of sampling to assess danger of epidemics, control, and natural enemies.

4936. LUITJES, J. Over de economische betekenis van insektenplagen in bossen (*Cephaleia alpina* Klug en *Diprion pini* L.). **[The economic importance of forest insect pests (*C. alpina* and *D. pini*).]** *Meded. Inst. toegep. biol. Onderz. Nat.* No. 40, 1958. pp. 56. 57 refs. [Du.e.*e*.]

Separate studies were made in several stands of various ages and quality classes, of the increment, and consequent financial, losses caused by attacks of *C. alpina* on Japanese Larch, and of *D. pini* on Scots Pine. The losses resulting from different degrees of defoliation were ascertained, e.g 40% defoliation in 20-year Q II Larch, and 12% defoliation in 20-year Q IV Pine both resulted in losses of 50 guilders/ha. The financial losses are compared with the cost of control operations.

4937. THALENHORST, W. Zur Kenntnis der Fichtenblattwespen. V. Die Populationsdichte der Nematini: Niveau und Fluktuationen. **[Spruce sawflies. V. Population density of the Nematini: level and fluctuations.]** *Z. PflKrankh.* 65 (10), 1958 (577–91). 23 refs. [G.g.e.] E.M.B.

[Cf. *F.A.* No. 4243.] Results of studies in 1950–57, using different sampling methods, are given in graphs and tables.

4938. KAPLER, J. E. **The biology and ecology of the Red-Pine sawfly in Wisconsin.** *Abstr. of thesis*, in *Dissert. Abstr.* 19 (7), 1959 (1874–5). O.R.S.

Presents results of studies on *Neodiprion nanulus nanulus* in 1955–57, including observations on the effect of defoliation on Red Pine (no serious effect after 1 year's defoliation, but 63·7% loss of height increment after defoliation in 2 successive years); the presence of the sawfly on Jack Pine, and the degree of resistance shown, indicated by needle drying shortly after oviposition with consequent egg mortality; and natural control by parasites and predators.

4939. COYNE, J. F. ***Neodiprion taedae linearis*, a pest of Loblolly and Shortleaf Pines.** *For. Pest Leafl. U.S. For. Serv.* No. 34, 1959. pp. 4.

4940. DOWNING, G. L. **Hemlock sawfly [*Neodiprion tsugae*].** *For. Pest Leafl. U.S. For. Serv.* No. 31, 1959. pp. 4. 2 refs.

4941. BRUNS, H. Untersuchungen und Beobachtungen an einer Naturkolonie der roten Waldameise (*Formica rufa*) im Schadgebiet der kleinen Fichtenblattwespe (*Pristiphora abietina*). **[Observations on a natural colony of *F. rufa* in an area infested by *P. abietina*.]** *Z. angew. Ent.* 43 (3), 1958 (326–35). 12 refs. [G.g.e.] O.H.

Reports on prey counts, pupal counts etc., in a Spruce/Pine stand having 26 nests on 7·5 ha. in Cloppenburg district. Maximum number of *P. abietina* larvae counted per ant nest and day was ca. 10,000. Pupal densities increased markedly with distance from nests. In a mild infestation, defoliation in an ant area in the second year was visibly less than in unprotected areas, but not in a severe outbreak [cf. *F.A.* 19 Nos. 659, 2086].

4942. GRAHAM, S. A., and SATTERLUND, D. R. **Weather, water levels, and Larch sawfly cocoons.** *For. Sci.* 5 (1), 1959 (28–36). 4 refs.

[Cf. *F.A.* 18 No. 687.] Discusses the effect of weather on sawfly cocooning in the Ottawa forest, Mich., 1930–57, as indicated by meteorological data interpreted by well levels, and the control exercised by mammalian predators. The hydrological conditions (pattern of water-table variations), vertical distribution of cocoons, influence of dry seasons and high temperatures, and the predatory activities of small mammals and parasites, are appraised for their contribution to the totality of factors operating against the cocooning of the sawfly.

4943. KŘÍSTEK, J., and OBRTEL, R. Příspěvek k poznání cizopasníků pilatky proužkované (*Pachynematus scutellatus* [Htg.]). **[The parasites of *P. scutellatus*.]** *Zool. Listy, Brno* 7 (4), 1958 (309–24). 18 refs. [Cz.cz.russ.g.*g*.] O.R.S.

In experiments in 1952–56, 21 parasitic Hymenoptera were bred from the pupae, and 13 species of Ichneumonidae and one of Chalcididae were added to the list of parasites, of *P. scutellatus*. *Ischurgops ornatus* sp.nov. is described. *From authors' summary.*

4944. ŽIVOJINOVIĆ, D. Masovna pojava jasenove lisne zolje. **[An outbreak of *Macrophya punctum-album*.]** *Šumarstvo* 11 (9/12), 1958 (661–2). [Serb.]

Defoliation of Ash in the park at Bela Crkva, Serbia, in 1956–58 was traced to *M. punctum-album.* It was controlled by Neosol-6 sprayed by a Swingfog.

4945. Martinek, V. Příspěvek k poznání bionomie a populační dynamiky pilatky *Pteronidea salicis* L. (Hym., Tenthredinidae). **[The bionomy and dynamics of populations of *P. salicis*.]** *Zool. Listy, Brno* 7 (1), 1958 (1–20). 41 refs. [Cz.cz. russ.f.*f*.] O.R.S.

Presents observations on the rise and decline of an outbreak in Dobruška (N.E. Bohemia) in 1951–53 on: life cycle; parasites reared (*Trematopygus facialis*, *Cleptes pallipes*, *Glyphicnemis brevis*, *Mesoleius segmentator*, *Mesochorus dimidiatus* and *Aptesis nigrocincta*), showing that *T. facialis* and *C. pallipes* arrested the build-up of *P. salicis* in the area; and damage to the preferred host, showing that defoliation was heavy in the lowest 5 m. of the stem, decreasing with increasing height in the tree, but that damage would be serious only in osier beds.

4946. Autuori, M. Contribuição para o conhecimento da saúva (*Åtta* spp.—Hymenoptera—Formicidae). VI—Infestação residual da saúva. **[Leaf-cutting ants (*Atta* spp.). VI. Residual ant infestation.]** *Arquivos do Instituto Biológico, São Paulo* 23, 1956 (1957), (109–16). [Port.e.] E.M.B.

From earlier work the stages of development of the ant colonies were known, e.g. the fact that a nest takes ca. 20 months to become visible. In 80 plots in a *Eucalyptus* plantation in Brazil, all 944 nests found were destroyed with formicide applied through entrances in the nest, regardless of cost. Six months later, 105 more nests were found, which had not been visible at the first treatment. On 15 plots, 29 of these residual infestation colonies were allowed to develop freely. One year later there were 143 colonies on these 15 plots. It is concluded that ridding extensive areas of infestation is impossible. Areas where infestation is to be kept low must be inspected regularly (3–6 months), and the nests destroyed as soon as they become visible.

Diptera

See also Nos. 4838, 4841.

4947. Postner, M. Zum Auftreten der Tannennadelgallmücke *Agevillea abietis* Hubault (Cecid. Dipt.) in Süddeutschland. **[The occurrence of *A. abietis* in southern Germany.]** *Anz. Schädlingsk.* 32 (2), 1959 (23–6). 21 refs. [G.g.]

A. abietis has been on the increase in Germany since 1954, causing considerable damage to young Silver Fir up to 15 years old on mountain sites up to 500 m. alt. Notes are presented on its occurrence in Bavaria to date. Climatic and site factors influencing attacks are reviewed. Young, very dense, even-aged stands are the most vulnerable. Control measures, both silvicultural and chemical, are discussed.

4948. Berger, H. Über die chemischen Bekämpfungsmöglichkeiten der Kiefernnadelscheidengallmücken. **[Chemical control of *Thecodiplosis brachyntera* and *Cecidomyia baeri*.]** *Allg. Forstzeitschr.* 14 (3; 4), 1959 (53–6; 70–1). 14 refs. [G.g.]

Briefly describes the bionomics of the insects and needle injuries caused in 3- to 4-year-old Pine plantations in S.W. Germany. Spraying with 0·5% Dipterex [see *F.A.* 18 No. 3070] to run-off in May reduced *T. brachyntera* infestation by 83%. Repetition 20–30 days later increased the effect, but single sprayings at later dates and spraying with Kupfer-Gesarol and Largan [endrin-type] were less successful. Of the preparations tried against *C. baeri* in early July, 0·5% Systox (300 litres/ha.) gave best protection (most short shoots only insignificantly damaged), followed by 2% Activ-Gesarol 50 (BHC/DDT mixture) with or without simultaneous spraying of Dithane (against *Lophodermium pinastri*), with Dipterex and Largan much less effective. [Cf. *F.A.* 20 No. 4841.]

4949. Hedlin, A. F. **The effect of moisture and temperature on the emergence of the larva of the Douglas Fir cone midge, *Contarinia oregonensis* Foote from cone scales.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 15 (2), 1959 (3–4).

Experiments showed that the larvae will not emerge under air-dry conditions; moisture is required before emergence takes place, and a saturated condition is preferred. Though larvae emerged at all temperatures tested (0, 5, 10, 15, and 20° C.) they showed preference for the lower temperatures.

459. Other Animals

See also No. 4770

4950. Bridgland, L. A., and Byrne, P. N. **Control of the giant snail (*Achatina fulica*) by [poison] baiting.** *Papua N. Guinea agric. J.* 11 (3), 1956 (1959), (67–8). E.M.B.

Cardboard strips 0·2 × 3 × 42 in. are dipped in a mixture made by adding slowly to 1 lb. of metaldehyde powder, 1 pint of water containing 30 drops of detergent (Teepol), blending in 2 pints of Flintkote, and making up to one gallon with water and stirring. The strips are dried in the shade and stapled into rings with a 10-in. overlap for stiffness. These are set round each plant. A trial of 25,000 rings indicates 2–3 months' complete protection and a snail population so reduced that the effective period is considerably extended. A mixture of one volume each of cement, sawdust and metaldehyde, shade dried, in trays ½ in. deep, and broken into pieces of 1 sq.in. can be used as bait (4 pieces per plant). Both methods cost ca. 2d./plant.

4951. Donaubauer, E. Über Schäden durch Nematoden in österreichischen Forstpflanzgärten. **[Damage by nematodes in Austrian forest nurseries.]** *Anz. Schädlingsk.* 32 (5), 1959 (68–9). 7 refs. [G.]

During 1958 a root 'disease' of conifers (mainly Spruce) reported from a number of forest nurseries in Austria was traced to nematodes. The injuries so caused are briefly described.

46. Damage by Man

See also Nos. 4051–2, 4255.

4952. Briscoe, C. B., and Box, B. H. **Stain associated with nails in trees on permanent plots.** *LSU For. Notes La. agric. Exp. Sta.* No. 25, 1959. pp. 2.

One year after nails were driven into living trees (Pines, Oaks, Sweetgum), every nail, regardless of type, was accompanied by stain or pitch streak. Alternative methods of marking trees on permanent sample plots should be found.

48. Injuries Due to Unknown or Complex Causes

See also Nos. 4284, 4295, 4299, 4384.

4953. JAHN, E., and DONAUBAUER, E. Über ein Lärchen- und Fichtensterben in Österreich. **[A dieback of Larch and Spruce in Austria.]** *Anz. Schädlingsk.* 32 (6), 1959 (81–7). 18 refs. [G.]

Reviews the dieback of Larch and of Spruce occurring in Austria during the latter half of 1957 and the growing season of 1958. The course of the disorder and the insects and fungi associated with it are described, along with the meteorological conditions obtaining. The damage appears to have been caused by a mild period during the preceding winter (particularly in February), succeeded by frost damage, which gave entry to the Larch canker fungus (*Dasyscypha willkommii*), and to *Ophiostoma* and other parasites, and later to attack by Scolytidae, Cerambycidae and Curculionidae.

4954. O'CARROLL, N. **Needle fusion in *Pinus contorta* in Ireland.** *Irish For.* 16 (1), 1959 (22–3). 4 refs.

The condition was first noted in Ireland in 1958 in Co. Tipperary and has since been reported also from Co. Cork. In both cases the affected stands are growing on an infertile podzol, with iron pan, of old-red-sandstone origin. [Cf. *F.A.* 12 No. 2300; 14 No. 2345.]

4955. MCMINN, R. G., and MOLNAR, A. C. **Further observations on pole blight and climate.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 15 (1), 1959 (2–3).

The coincidence of pole blight of *Pinus monticola* in British Columbia with the hot, dry part of a climatic cycle supports the hypothesis that this disorder is related to the occurrence of such conditions. This is further corroborated by a recovery trend in some trees after and during cooler, moister summers. [Cf. *F.A.* 16 No. 3239; 20 No. 829.]

4956. LEAPHART, C. D., and GILL, L. S. **Effects of inoculations with *Leptographium* spp. on Western White Pine.** *Phytopathology* 49 (6), 1959 (350–3). 8 refs.

Final evaluation of a series of experiments involving inoculation of healthy dominant and codominant trees by various techniques in 1949–51 indicated that in 1954 $<3\%$ of the infections were still active; of 941 roots inoculated, 43 were killed and only 19 still actively infected. Development of necrosis varied with position on stem, virulence of the inoculate and callusing ability of trees. [Cf. *F.A.* 13 No. 3988; 17 No. 1824.]

4957. ANDERSON, N. A. **Needle droop of Red Pine.** *Tech. Note Lake St. For. Exp. Sta.* No. 549, 1959. pp. 2.

In a plantation in N. central Minnesota, ca. half the trees showing needle-droop symptoms had dead terminal buds. These trees had lost 3 years' height growth and were deformed. No injury was noted on Jack Pine in the same plantation. Some conditions producing needle-droop symptoms are briefly described.

4958. RODGER, G. J. **Spindle stands.** *Rep. For. Timb. Bur. Aust. 1957*, 1958 (24).

An experiment in mowing ground cover among young *Pinus radiata* in a 5-year-old 'spindle stand' [cf. *F.A.* 18 No. 4368] showed initial depression of height increment, but this effect was reversed after a second year's mowing. It appears that mowing for 2 years is as effective as mowing for a longer period.

4959. BUTIN, H., and SCHÜEPP, H. Schäden an Kastanien nördlich der Alpen. **[Damage to [Sweet] Chestnut north of the Alps.]** *Mitt. schweiz. Anst. forstl. Versuchsw.* 35 (2), 1959 (267–72 + 2 photos). 4 refs. [G.f.it.e.]

Describes severe injuries near Lake Neuchâtel, Lake Geneva, and Walensee. The severe frost of 1956 is thought to be the primary cause, with fungal attack indicating the severity of the frost damage and constituting an additional factor. *Armillaria mellea* and *Diplodina castaneae* are considered the most important pathogens. [Cf. *F.A.* 18 No. 1785.] *From authors' summary.*

4960. FRASER, D. A. **Nine years of observations on the condition of 241 Yellow Birch.** *Tech. Note For. Br. Can.* No. 69, 1959. pp. 18. 16 refs.

The crowns of 241 Yellow Birch were classified during 1949–57 into numerical health indices ranging from I (healthy crown) to X (dead) and XI (fallen). There was a progressive improvement in crown conditions from 1949 to 1951, followed by a gradual regression until 1957, when the health of the Birch was essentially the same as 9 years earlier. Crown changes bore no relation to site differences on the experimental plot. Radial growth was not reduced until the crown declined to an index of IV or higher. Defoliation of the hardwood species other than Yellow Birch in 1951 by tent caterpillars temporarily opened the canopy and may have contributed to the improvement of Yellow Birch crowns at that time. *From author's summary.*

4961. TOOLE, E. R. **Sweetgum blight.** *For. Pest Leafl. U.S. For. Serv.* No. 37, 1959. pp. 4. 6 refs. [Cf. *F.A.* 19 Nos. 751–2.]

4962. TOOLE, E. R., and BROADFOOT, W. M. **Sweetgum blight as related to alluvial soils of the Mississippi River floodplain.** *For. Sci.* 5 (1), 1959 (2–9). 8 refs.

Using data from 76 stands of *Liquidambar styraciflua*, mainly on recent and old levees and slackwater soils, and from core samples for each foot down to 4 ft. in these soils, regressions are calculated showing positive correlations between blight intensity and K in the second foot, Na in the third foot, and % of imbibitional water in the top and second foot; also a negative correlation with bulk density in the top foot. Slackwater soils had significantly more blight. The data strongly suggest that blight here is primarily a reaction to soil moisture shortages, though the possibility is not excluded that these act indirectly through an, as yet unknown, pathogen.

4963. TOOLE, E. R., and BROADFOOT, W. M. **Irrigation lessens Sweetgum blight.** *Sth. For. Note Sth. For. Exp. Sta.* No. 120, 1959 [2].

On two ¼-acre plots in well stocked, 40-year stands in Mississippi, which were ditch-irrigated in 1957 and 1958 whenever the available soil moisture dropped below 40% of field capacity, the disease index dropped by 68% in 2 years, while on unwatered controls it rose by 26%. [Cf. *F.A.* 19 No. 752.]

4964. CAMPANA, R. J. **Dutch Elm disease and related troubles of Elms.** *Trees Mag., Ohio* 18 (6), 1958 (6–10).

Tabulates causal agents, symptoms and injury (with a key), tissue initially affected, and control measures for common diseases, insect pests, and environmental troubles of Elms, and also the relation of incidence of Dutch Elm disease to other disturbances.

5. FOREST MENSURATION. INCREMENT; DEVELOPMENT AND STRUCTURE OF STANDS. SURVEYING AND MAPPING

4965. SCHÄFER, H. R. Die Bedeutung der Lochkartenverfahren für die forstliche Forschung. **[The value of punched cards in forestry research.]** *Forschungsergebnisse zur Förderung der forstlichen Erzeugung, Bundesministerium für ELF (AID), Hiltrup (Landswirtschaftsverlag)* No. 2, 1959 (64–88, 91–2, 94, 96). 39 refs. [G.g.e.f.]

Discusses the uses of machine- and hand-sorting systems and their merits, giving instances of applications in administration (e.g. wages accounting), surveying, management and research in various countries, more particularly the use of Hollerith systems at Hann. Münden in constructing volume and form-factor tables for Japanese and European Larch, computations on sectionally measured sample stems, and increment studies on permanent sample plots.

52. Measurements of Stem Dimensions and Volume of Trees, Stands, Forests and Timber

4966. STÖHR, F. K. Der Forstentfernungs- und Stammzahlmesser. **[A forestry instrument measuring distances and stem numbers.]** *Allg. Forstzeitschr.* 14 (17), 1959 (338–40). 12 refs. [G.]

The instrument consists essentially of one fixed mirror (or prism) A, at one end of a 55-cm. crossbar, and another larger mirror B at the other end, the latter rotatable on its axis and fitted with an indicator that records distances direct on a scale when the image of a distant tree reflected from B to A is made to coincide with the tree itself sighted direct over A, while the bar is held at right angles to the distance to be measured. Suggested uses include (*a*) simplification and speeding up of height measurements with Blume-Leiss-type dendrometers; (*b*) measurement of d.b.h. on distant trees: for this purpose the mirror image of one side of the stem is brought into coincidence first with one and then with the other side of the directly seen stem, and the readings on the distance scale are converted into d.b.h. with the help of a table on the back of B; (*c*) determination of stem numbers per ha.: for this purpose B is set at an angle so as to indicate a given distance *E*, and the observer makes a sweep, counting all trees within a circle, whose images appear to the right of the mirror image (coinciding images being counted as ½). For $E = 17{\cdot}85$ the count represents 0·1 ha., for $E = 12{\cdot}6$, 0·05 ha., etc.; (*d*) as a relascope, with suitable markings on B.

4967. CORONA, E. Rilievi dendrometrici su betulle nell' Alta Val Fersina (Trentino). **[Mensurational data on *Betula verrucosa* in the upper Fersina valley (Trentino).]** *Monti e Boschi* 10 (5), 1959 (217–26). 18 refs. [It.f.e.]

Gives data on height, basal area, and the relation of volume to height, d.b.h., and bark %, in tables and graphs.

521. Diameter (Girth) and Sectional Area

See also Nos. 4645, 4966.

4968. HOLLAND, D. A. **Studies in the measurement of Apple trees. IV. The use of branch girths to estimate tree size.** *Rep. E. Malling Res. Sta. 1957/58*, 1959 (77–9). 5 refs.

The recommendation to substitute an integration of branch girth for trunk girth as an estimate of tree size when the measurement of trunk girth is impracticable [see *F.A.* 17 No. 4265] is examined empirically and found to be satisfactory in any circumstances in which trunk girth would be useful if available. *Author's summary.*

4969. BOWER, R. F., *et al.* **Correction and use of prisms for point-sampling.** *J. For.* 57 (3), 1959 (201–2).

Describes in detail a method of testing a cheap wedge prism and correcting it to a 3·03 diopter strength (and a basal-area factor of 10) by a special mounting. Statistically accurate results were obtained with such mounted prisms,

4970. BITTERLICH, W. Relaskoptechnik. Rationelle Waldmessung durch Spiegelrelaskop. **[The technique of the Relascope. Efficient forest mensuration work with the mirror Relascope.]** *Cbl. ges. Forstw.* 76 (1), 1959 (1–35). 39 refs. [G.]

A guide to the uses of the mirror Relascope in practical management surveys, discussing questions of accuracy, avoidance of errors (e.g. treatment of marginal leaning trees), the determination of stem numbers, b.a., and sampling densities by diameter classes, with supporting tables, based on d.b.h. measurements of the trees included in the count, determination of mean heights and Pressler's form height [cf. next abstract] and volume and assortment computations based thereon. In addition, the use of angle-count data combined with other survey data, such as stem and crown quality, age and increment (determined by cores) and their evaluation are discussed, with sample forms for field work and punched cards.

4971. Bitterlich, W. Presslers Richthöhe in neuem Licht. **[Pressler's volume determination method in a new context.]** *Allg. Forstztg.* 70 (5/6), 1959 (47–9). [G.g.]

Describes a simple method of volume determination with the help of the latest model of the Relascope [cf. *F.A.* 20 No. 3538], based on Pressler's formula [cf. *F.A.* 11 No. 2337] for the computation of form height. The mean of the form heights of the trees counted in an angle count is the true mean form-height of the stand.

522. Height, Length

See No. 4966.

524. Determination of the Volume of Trees and Stands

524.1. Principles of Volume Determination. Form (Taper)

See also Nos. 4970–1, 4978, 4981.

4972. Grosenbaugh, L. R. **Giant-tree volumes for machine use.** *Sth. For. Note Sth. For. Exp. Sta.* No. 117, 1958 [2–3].

Formulae for electronic computing are given for surface area, cu.ft. volume and bd.ft. volumes of whole stems and sections, based on the height H of the imaginary cone [cf. *F.A.* 17 No. 685] for which the formula is given as $H =$ (d.b.h. in in.) (form class as a decimal fraction) (8) + 16.

4973. Todorović, D. Osvrt na definiciju oblika stabla. **[A reappraisal of the definition of stem form.]** *Šumarstvo* 11 (9/12), 1958 (573–88). 15 refs. [Serb.e.f.]

A mathematical examination, criticizing in detail the approaches of former workers, e.g. Metzger, Kozicyn, Hohenadl and Moer, and developing functions that represent the stem's whole length; two of these [Nos. (9) and (10) in text] are, the author claims, simple to apply in the field.

4974. Briscoe, C. B. **Tests of Girard form class estimation from lower bole taper.** *J. For.* 57 (3), 1959 (207–8). 3 refs.

Analyses and compares two methods [cf. *F.A.* 17 No. 4273; 18 No. 715] of utilizing lower bole taper to estimate Girard form class. Horn's method is the more easily applied, but it would seem that on bottomland sites subject to flooding it must be modified to allow for the greater lower bole taper.

524.3. Volume of Tree Groups and Stands

See also Nos. 4399, 4404, 4970–2, 4984, 4988.

4975. Takata, K. **[Studies of the volume estimate by basal area at breast height (4). Construction of stand volume table.]** *J. Jap. For. Soc.* 39 (12), 1957 (465–70). 4 refs. [Jap.jap.e.]

Of 3 stand volume equations tested against actual volume where $G =$ total b.a., $\bar{G}$ mean b.a. of the stand, $\bar{D}_G$ the diameter of $\bar{G}$, N the number of trees and $\bar{H}$ mean height according to Bitterlich [cf. *F.A.* 19 No. 757] the formulae $V = G\bar{H}/(a + b\bar{D}_G)$ and $V = (a + b\bar{G} + c\bar{H} + d\bar{G}\bar{H})N$ were the most accurate, and are presented in table form. [Cf. *F.A.* 20 No. 842.] *From author's summary.*

4976. Bernard, F. Établissement d'un tarif de cubage. Étude statistique. Quelques résultats pour le Gabon. **[Computation of volume tables. A statistical study with some results from Gabon.]** Centre Technique Forestier Tropical, Nogent sur Marne. [1956?] pp. 36 + 5 tbls., 8 gphs. 6 refs. [F.f.]

Discusses statistical principles and formulae for the computation of tree volume (V) from d.b.h. (d) and of stand volume from b.a. and from height. Experience has shown that the formula $V = A.d^n$, where A is a constant and n a value between 2 and 3, gives a good approximation for a given population, permitting the construction of straight regression lines on double logarithmic paper. Values for total volume and stem volume based on sectional measurements of 612 trees of one and 53 of another (mixed) population, and on commercial records for 65 Okoumé stems show a good correlation with this formula.

4977. Hepburn, A. J. **An investigation of the top-height/Hummel-tariff relationship in Norway Spruce.** *J. Oxf. Univ. For. Soc.* (*Ser. 5*) No. 7, 1959 (22–7). 7 refs.

The findings of Finch [see *F.A.* 19 No. 2117] on the relation of stand top-height and tariff number in U.K. conifers, were investigated in two Norway Spruce stands of similar age but different site conditions, and somewhat different past treatment, in Bagley Wood, Oxford. The specific points investigated were: (*a*) tariff values by top heights; (*b*) the relationship of thinning tariff to main-crop tariff; (*c*) the assumption that age (or site) did not upset the top-height/tariff relationship. The investigation confirmed the results obtained by Finch. The chief possible source of error appears to lie in the assumption that sample thinnings represent mean trees in the stand 10 and 20 years earlier. The mean height of the thinnings in 1957 (55·8 ft.) was close to that of the main crop (57·9 ft.), though the mean basal areas differed considerably (0·231 and 0·329 sq.ft.).

4978. Burstall, S. W. **Combined taper and volume tables for European Larch—New Zealand 1956; all stands.** *N.Z. For. Res. Note* No. 14, 1958. pp. 22. 5 refs.

[With an introduction by *G. Duff.*] The tables show diam. in inches and cumulative volume in cu.ft. at stated heights above ground, total stem volume, and merchantable volume to 4-in. and 6-in. tops, all u.b., for single-in. d.b.h. and 10-ft. total-height classes.

4979. Bennett, F. A. **International ¼-inch board foot volume tables for old-field Slash Pine plantations in the middle coastal plain of Georgia.** *Res. Note Stheast. For. Exp. Sta.* No. 126, 1959. p. 2.

Tables give volume based on d.b.h. and total height or merchantable height, in both cases to minimum top diameters u.b. of 6 in. or 7 in. [Cf. *F.A.* 15 No. 1643.]

4980. Antoniotti, G. B. Saggio di tavola dendrometrica dell' acero campestre del Molise. **[A volume table for *Acer campestre* of the Molise.]** *Ital. for. mont.* 14 (2), 1959 (57–9). [It.it.f.]

A single-entry table (in terms of d.b.h.) for *A. campestre* growing as a tree in mixture with *Abies alba*, *Quercus cerris*, and *Fagus sylvatica* in the S. Apennines, and also an assortment table.

4981. Gomes, A. M. de Azevedo, and Andrade, T. M. do R. Rebelo de. Dois estudos dendrométricos (género *Pinus*). **[Two dendrometrical studies (genus *Pinus*).]** Direcção Geral dos Serviços Florestais e Aqüícolas, Ministerio de Economia, Lisbon. 1958. pp. 43. 4 refs. [Port.]

Presents (1) volume tables for *Pinus pinea* based on measurements taken on 113 trees felled in the Medos national forest and 78 in the Cabeção national forest, and (2) tables of form factors for *P. pinaster* and *P. halepensis*.

524.4. Recording of Data. Organization of Measuring Parties and Their Work

See Nos. 4965, 4970, 4988.

524.6. General Surveys of Forests and Whole Tracts of Forest. Partial Enumeration Surveys, Timber Cruising

See also Nos. 4969–70, 5411, 5420.

4982. Prodan, M. **Investigations concerning the carrying out of representative surveys.** Translation Service, Department of Internal Affairs, Wellington. 1958. pp. 35 + [19]. Transl. from *Allg. Forst- u. Jagdztg.* 129 (1), 1958 (15–33). [See *F.A.* 19 No. 3277.] Limited distribution.

4983. Strand, L. **The effect of the plot size on the accuracy of forest surveys.** Translation Service, Department of Internal Affairs, Wellington. 1958. pp. 7 + [9]. Transl. from *Medd. norske Skogforsøksv.* 14 (No. 48), 1957 (620–33). [See *F.A.* 19 No. 2126.] Limited distribution.

4984. Strand, L. Nøyaktigheten ved noen metoder til bestemmelse av kubikk- og tilvekstmassen på prọveflater. **[The accuracy of some methods for estimating volume and increment on sample plots.]** *Medd. norske Skogforsøksv.* 15 (4), No. 52, 1959 (278–392). [Nor.nor.e.*e.*]

In a study on 42 plots in Spruce stands in different parts of E. Norway, stratified sampling proved the most accurate for determining volume, and b.a. increment; the difference in accuracy between methods of estimating b.a. increment was small, and the same was true of volume increment.

4985. Cousens, J. E. **A pilot sampling scheme in the regenerated forests of Perak—1956. Project M.8. Research programme.** *Res. Pamphl. For. Res. Inst., Kepong* No. 23, 1958. pp. [43]. 17 refs.

Reports on the work previously described [see *F.A.* 19 No. 4615] with additional detail, an analysis of floristic data and clear-bole heights, and appendices illustrating stratification, principal species, forms used, etc.

4986. Kinashi, K., and Cho, M. **[The report of the forest inventory by [line-plot] sampling methods in the Mount Sampoo natural forests (the Kyushu University Forests in Miyazaki district).]** *Rep. Kyushu Univ. For.* No. 10, 1958 (1–66). 6 refs. [Jap.e.]

Summarizes results and describes methods used in an inventory made in 1956 for the purpose of estimating stand volume and growth in a 560-ha. area. Line plots 20 × 20 m. (0·04 ha.) were established at 200-m. intervals, on which the d.b.h. and height of all trees of d.b.h. $\geqslant$ 10 cm. were measured. Sample trees at a fixed interval (1 in 50) were felled and measured, increment cores being taken at b.h., and Huber's sectional-measurement method used to compute the volume. Because time was limited by rain etc., only 66% of the scheduled number of plots were surveyed and the area covered was 355 ha., giving a sampling % of 0·95, with measurements on 9 conifers and 28 broadleaved trees. Total volume obtained was 40,310 cu.m. (10,606 cu.m. conifers, 29,703 cu.m. broadleaved trees), and mean volume/ha. was 113 cu.m. ± 10·9. Stand p.a.i./ha. (H. A. Meyer's method) was estimated at 0·4307 cu.m. for conifers and 1·9817 for broadleaved trees, with respective growth %s of 1·56 and 2·45, and an over-all value of 2·23%. *From authors' summary.*

4987. Aoyagi, A. **[The report of the forest inventory by sampling methods in the Kyushu University Forests in Miyazaki district (Report No. 2).]** *Rep. Kyushu Univ. For.* No. 11, 1958 (1–30). [Jap.e.]

In a survey on 1646 ha., the survey line was laid out on a topographical map, and plot centres were fixed in relation to distinctive geographical features. On each plot (area 0·08 ha.), d.b.h. of all trees $\geqslant$ 6 cm. was measured, and tree height and increment cores were taken from ca. 1 tree in 50. In the 5 days available for the survey, rather under half the scheduled number of plots and total area were studied. Figures are given for total volumes and numbers of trees on the area studied for deciduous trees and conifers separately, and (tabulated) for increment. Stand p.a.i.'s per ha. (using H. A. Meyer's method) were 0·8067 cu.m. (*Abies firma*), 0·5651 cu.m. (*Pinus densiflora*), 0·4343 cu.m. (*Tsuga sieboldii*), 5·5027 cu.m. (deciduous trees) and 7·3088 cu.m. (over-all value) and the respective growth %s were 7·13%, 4·00%, 2·60%, 4·28% and 4·28%. *From author's summary.*

525. Volume of Assortments. Merchantable Volume

See also Nos. 4783–5, 5313.

4988. Foil, R. R. **Adaptation of local volume table to hand tally-meter yields rapid and accurate**

pulpwood estimate. *LSU For. Notes La. agric. Exp. Sta.* No. 30, 1959. pp. 2. 1 ref.

Describes a method of estimating pulpwood volume (e.g. when marking for thinnings) without the expense of measuring and recording height and diameter, through adaptation of local volume tables. Estimates were found to be accurate within 2% of true value. The only equipment necessary is a hand tally-meter. A local volume table is developed for the stands to be considered (any method may be used, so long as cord volume per tree by diam. class is derived). This is reduced by division, to yield relative volume factors which are whole numbers and multiples of the volume of the smallest diam. class (2-in. diam. classes will generally suffice). The reciprocal of the cord volume of the lowest diam. class is taken as a constant which is used to convert volume factors to cord volume. In field application, tree diameter should be estimated and the appropriate volume factor for that diameter class recorded on a hand tally-meter. This is repeated for each tree marked or counted, thus producing a cumulative total of volume factors. At any time, this total may be converted to cord volume by division by the constant.

526. Log Measurement. Scaling

See also Nos. 4622, 5081.

4989. MARTIN, W. H., and SIMARD, H. **Weight as a basis for wood measurement.** *Pulp Paper Mag. Can.* 60 (5), 1959 (149–55, 168). 27 refs.

[Cf. *F.A.* 18 Nos. 3181–2.] Briefly reviews and compares the use of weight as a basis for wood measurement in the U.S.A. and Canada, and describes a Canadian instance of the ton-mile hauling of pulpwood. The problem of weight measurement unrelated to volume is analysed and treated mathematically, and the base weight method (b.w.m.) developed, in which the wet weight, W_t, is assumed to be affected by time in a particular manner, leading to the equation $W_t = PQ^t + S$, where P is the amount of water that will theoretically evaporate from time $t = 0$ to $t = \infty$, Q is one minus the rate of evaporation and S is the air-dry weight of the wood. This equation is tested statistically on two sets of pulpwood data, the regressions being shown in graphs. The design and application of tests required before routine application of the b.w.m. is possible are outlined in appendices.

4990. HAYGREEN, J. **Dry weight of green Aspen bolts.** *For. Prod. J.* 9 (1), 1959 (38–42). 13 refs.

Conversion factors for converting green volume, determined by an immersion technique, into air-dry volume or air-dry weight were computed for 4-foot barked or unbarked logs of *Populus grandidentata* from two sites in Michigan. Whereas estimates of dry weight from green weight had proved too inaccurate, the volume method is considered satisfactory, volume losses during the short period of storage in the forest being unimportant. The green-/dry-volume ratio was independent of log diameter or position in the tree, while the green-volume/dry-weight ratio decreased with increases in diameter and growth rate.

4991. BAUGER, E. Kubikk- og stykkepristabell for furutømmer i hele lengder i Møre og Romsdal. **[Volume and standard price tables for Scots Pine long timber in Møre and Romsdal.]** *Medd. Vestland. forstl. Forsøksst*a. 11 (1), No. 33, 1959 21–56). 8 refs. [Nor.e.*e*.] Cf. *FA*. 17 No. 703.]

53. Special Measurements of Trees and Stands (Crown Dimensions, Stand Density etc.)

See also Nos. 4966, 4972, 5024–5, 5032.

4992. MARDEN, R. M., and CONOVER, D. F. **Diagraming techniques for describing tree stems and crowns.** *J. For.* 57 (3), 1959 (173–5). 1 ref.

Describes a form prepared for noting detailed descriptions of stem and crown characters—e.g. stem defects, crown length, width etc., and methods of using it. Also describes and illustrates a Russian method of recording crown projection [see *F.A.* 17 No. 3113].

4993. WILEY, J. J. JR. **Control techniques for managed even-aged stands.** *J. For.* 57 (5), 1959 (343–7).

Observations in Pine and hardwood forests from Georgia and Pennsylvania showed that growth restriction begins when the crowns touch, and thus the square of the diameter of the average crown indicates the growing space needed by the tree. Dividing 43,560 (sq.ft. in 1 acre) by this figure (in sq. ft.) gives the number of trees that will occupy this acre in a fully stocked stand. Further studies showed a straight-line relationship for crown/stem diameter (until large diameters are reached), unaffected by site quality or stand density, so that for a given d.b.h. the number of trees, and hence the b.a., per fully stocked acre could also be determined —knowledge useful in determining optimum plantation spacing. It was concluded that managed stands would be composed of trees of the same size as the dominants and co-dominants that are measured in site-index determination. Using the mean d.b.h. and height of dominants and co-dominants on the various sites and at the various ages, supplemented by crown-diameter data from crown/stem-diameter curves, tables were prepared showing the numbers of trees required in fully stocked managed stands. Volumes were applied from standard volume tables, bd.ft. and cord separations being based on the range of d.b.h. shown in the various classifications. This type of table provides a guide and control for thinning type and intensity, by providing information on correct spacing of the residual stand. A portion of such a yield table for fully stocked, managed Loblolly Pine is shown.

54. Assessment of Site Quality

See also Nos. 4080–1, 4256, 4355, 4538, 5027.

4994. PARDÉ, J. Production ligneuse et indice de Paterson. **[Wood production and Paterson's index.]** *Schweiz. Z. Forstw.* 110 (4), 1959 (211–21). 6 refs. [F.g.]

A description and critical evaluation of the CVP index. A comparison of m.a.i. (for rotations of 75–90 years) recorded on a number of French permanent sample plots for indigenous climax species showed a good correspondence with values predicted by Paterson. Exotics, notably Douglas Fir, often had m.a.i. values 2 or 3 times as great. [Cf. *F.A.* 20 Nos. 3567–8.]

4995. PUDDEN, H. H. C. **Quality classification of exotic softwoods. I. *Cupressus lusitanica*—height indices, Londiani and Elburgon Divisions, [Kenya].** *Tech. Note For. Dep. Kenya* No. 57, 1958. pp. 4.

From many samples in 14 plantations of 20 to 30 years and 77 of 5 to 19, the equation: top height (mean of the tallest 100 trees per acre) $= 8{\cdot}21 + 4{\cdot}326 \text{ age} - 0{\cdot}0504 \text{ age}^2$, was developed. Curves are drawn on either side of this to represent age/height values 110, 120, 130 and 140% better and 90, 80, 70 and 60% inferior, so as to provide a standard for all Kenya plantations. It is contended that the East African quality-classes [cf. *F.A.* 19 No. 4627] will be extremely awkward to use in Elburgon, where the boundary between Q I and II wavers on either side of the mean curve shown here.

4996. ASSMANN, E. Höhenbonität und wirkliche Ertragsleistung. **[Site quality and actual yield.]** *Forstwiss. Cbl.* 78 (1/2), 1959 (1–20). 24 refs. [G.]

Discusses the influence of site, method of formation and stand treatment on the relation between site quality as expressed by height, and yield of Spruce, using data from several German trial plots, and makes proposals to improve yield tables.

4997. MCGEE, C. E., and BENNETT, F. A. **Site index curves for old-field Slash Pine plantations.** *Res. Note Stheast. For. Exp. Sta.* No. 127, 1959. pp. 2.

The curves cover ages (since planting) from 10 to 25 years, for the middle coastal plain of Georgia and the Carolina Sandhills. [Cf. *F.A.* 14 No. 2608; 18 No. 760.]

4998. GAGNON, J. D., and MACARTHUR, J. D. **Ground vegetation as an index of site quality in White Spruce plantations.** *Tech. Note For. Br. Can.* No. 70, 1959. pp. 12. 6 refs.

The stands on 62 $\frac{1}{10}$-acre permanent sample plots in a 31-year-old White Spruce plantation on old farm land at Grand'Mère, Quebec, were assigned to good, medium and poor quality classes identified by ground vegetation. Height measurements of dominant trees on the plots indicated that the quality classes revealed by vegetation were valid. Volume growth, b.a., average height and diameter, and survival all gave the same indication. Several workers have shown that site quality can be evaluated on the basis of plant associations in undisturbed stands. The present study indicates that similar relationships hold for disturbed areas as well. The need for a more complete knowledge of plant succession in disturbed areas as a guide to reforestation is suggested. *Authors' summary.*

4999. ZINKE, P. J. **Site quality for Douglas-Fir and Ponderosa Pine in Northwestern California as related to climate, topography, and soil.** *Proc. Soc. Amer. For.* 1958 (1959), (167–71). 4 refs.

An analysis of data from the Californian soil/vegetation survey [cf. *F.A.* 15 No. 3936] using trees from 363 plots whose site indexes (height at 100 years) varied from 85 to 204 ft. for Douglas Fir and 62 to 171 for Ponderosa Pine. Factors analysed were annual precipitation, position with regard to fog belt; altitude, slope and exposure; depth, texture and pH of soil; and type of parent material. Soil depth and altitude emerged as the most important practical criteria.

5000. STOATE, T. N., and CROSSIN, E. C. **Site quality determination in young Douglas Fir.** *For. Chron.* 35 (1), 1959 (22–9). 2 refs.

[Cf. *F.A.* 17 No. 1851.] In the coastal Douglas Fir forests of British Columbia it has been found that annual height increment is a function of total height and that this new concept can be used as an index of site, thus obviating the need to determine age and difficulties in defining effective age. A series of freehand curves of annual height increment as a function of total height and age (now called Increment-Height Site Index) has been constructed from the range of height of 8–25 ft. of co-dominant trees and from site indexes 70–160 ft. It is important that co-dominants should be used, since the height of dominants is too irregular for this purpose. Usually the measurement of 4–5 internodes at a height of 8–25 ft. on 5 trees is a sufficient sample. For ready calculation of site in the young forest the following rule of thumb can be used. Measure the height increment of co-dominant trees of total height of (or as near as possible to) 8, 13, 18·5 ft.; (*a*) add 1 ft. to this measurement; (*b*) for trees of 8 and 18·5 ft., divide the result by 2 and 3 respectively and move the decimal point 2 places to the right; (*c*) for trees of 13 ft. multiply the result by 4 and move the decimal point 1 place to the right to give the site index. For trees >20 ft. in height, 1 ft. increment means 70 ft. site index, 2 ft. means 100 ft., 3 ft. means 130 ft., and 4 ft. means 160 ft.

5001. OLSON, D. J., JR. **Site index curves for upland Oak in the Southeast.** *Res. Note Stheast. For. Exp. Sta.* No. 125, 1959. pp. 2. 1 ref.

Based on 697 observations of 6 species in the Virginia-Carolina Piedmont and the Southern Appalachians. Some plots had site indexes (age 100) of >100 ft.

5002. NEEBE, D. J., and BOYCE, S. G. **Site index curves for Eastern Cottonwood [*Populus deltoides*].** *Sta. Note Cent. St. For. Exp. Sta.* No. 126, 1959. pp. 2. 1 ref.

Data were collected from 172 trees, mainly 11–32 years old, in 4 States. The curves, presented as straight lines, show the heights attained by the trees at 25 years. Average site index was 98 for bottomland, and 78 for upland and spoil-bank areas.

56. Increment. Development and Structure of Stands

See also Nos. 4212, 4216, 4239–40, 4242–3, 4355, 4365, 4373–5, 4393 *et seq.*, 4516–7, 4531–2, 4555 *et seq.*, 4884, 4920, 4936, 4938, 4984, 5449.

5003. ARLEN, W. H. **Growth of Slash Pine plantation on flatwoods in West-Central Florida.** *J. For.* 57 (6), 1959 (436).

Describes the site preparation, planting, spacings, survival, growth rate, and thinnings in a 25-year stand, with a table of thinning yields and standing volume for 7 plots of various initial spacings. An 8 × 8 ft. spacing seems to be best: it can produce sawtimber stands in 35 years, with three intermediate thinnings for pulpwood.

5004. EKMAN, S. G. Förbandets roll for skogsproduktionen från beståndsanläggningen genom beståndsbehandlingen intil slutavverkningen. **[The role of spacing in forest yield, from establishment, through stand treatment, to final fellings.]** *Svenska SkogsvFören. Tidskr.* 57 (1), 1959 (43–66). [Sw.]

A lecture by the manager of a pulpwood forest of Spruce and Pine in Central Sweden, giving some data on yields and stand development. The author found a linear relationship between stand height and optimum spacing and presents a thinning schedule based on height alone, to be applied to stands of different site classes, a minimum b.a. being stipulated for each site class. Computations of net financial yield (disregarding interest) are discussed for various initial densities etc. Planting was found to be desirable on the good sites, and, where possible, natural regeneration, involving a somewhat longer rotation, on poorer sites. In both cases an initial 4000 plants/ha. are aimed at for Pine, or 3500 for Spruce.

5005. PARDÉ, J., and TURPIN, P. Caractéristiques et production des peuplements de pins laricios du Domaine des Barres. **[Characteristics and yield of stands of *Pinus nigra* in the Domaine des Barres.]** *Rev. for. franç.* 11 (5), 1959 (376–91). 4 refs. [F.]

The provenances studied were (*a*) Calabrian, (*b*) Crimean, and (*c*) Corsican. All three much surpassed (*d*) *P. sylvestris.* M.a.i. in cu.m./ha. from 1st to 75th year was: (*a*) 10–11, (*b*) 10, (*c*) 8·8–10·9, and (*d*) 5–6. It is concluded that *P. nigra*, and particularly the Calabrian provenance, must be considered fast growing and suitable for planting extensively in Central France on non-calcareous soils.

5006. DRESCHER, W. Vergleichende bestands- und ertragsgeschichtliche Untersuchungen in Fichten-Beständen und Fichten-Buchen-Tannen-Mischbeständen der Hochlagen des südlichen Schwarzwaldes. **[Stand history and yield in pure Spruce and mixed Spruce/Beech/Fir stands in the higher altitudes of the S. Schwarzwald.]** *Mitt. Ver. forstl. Standortskunde ForstpflZücht.* No. 8, 1959 (45–51). [G.g.]

A comparative analysis, based mainly on working plan data and felling records, of 1256 ha. of State forest on sites of fairly uniform good quality at 750–1250 m.alt. for the period 1897–1955. In general, mixed stands with high proportions of Beech (40–70% in youth, 10–30% at maturity) were equal to or better than pure Spruce in yield, particularly on the cooler sites. They also showed higher biological soil activity.

5007. ALEMDAĞ, Ş. Türkiyedeki ladin + köknar meşcerelerinin kuruluşları, ağaç servetleri ve tecessümleri üzerinde bazı müşahadeler. **[Some observations on stand constitution, volume and increment of Spruce/Fir stands in Turkey.]** *Orm. Araşt. Enst. Derg.* 4 (2), 1958 (59–72). 2 refs. [Turk.e.*e.*]

Tabulates and graphs the data for a 1·5-ha. plot in the Artvin region, at 1715 m. alt. *Picea orientalis* forms 46·6, and *Abies nordmanniana* 53·4% of the stand, the average age of which is 118 years.

5008. BELTRAM, V. Prilog poznavanju divleg kestena i upotrebe njegovog drveta u Sloveniji. **[*Aesculus hippocastanum* and the use of its wood in Slovenia.]** *Šumarstvo* 11 (9/12), 1958 (643–8). 3 refs. [Serb.e.f.]

Analyses mensurational data of a group of 17 *A. hippocastanum* trees near Ljubljana, having a mean volume of 3·7 cu.m. Notes are given on some silvicultural characters, a fungal pest (*Guignardia aesculi*) [cf. *F.A.* 20 No. 4812], and the working properties and uses of the wood. The author suggests its possible introduction as a lower-storey species in Poplar plantations.

5009. GINCULJ, S. Gajenje divljeg kestena u Vojvodini. **[Cultivation of *Aesculus hippocastanum* in Vojvodina [Serbia].]** *Šumarstvo* 11 (9/12), 1958 (649–52). [Serb.e.f.]

A plantation of 2–3 ha. of Ash/Horse Chestnut was established in 1926 and some Poplars (*P.* × *marilandica* and *P.* × *serotina*) were introduced later. In 1948 most of the Poplars were removed, and in 1954 fellings to favour the Ash removed 33 cu.m. of Horse Chestnut (which in some cases overtopped the Ash) and 12 cu.m. of the less vigorous Ash. Enumeration data (which are given) from a one-ha. sample plot in 1956 showed that, despite the fellings, the average Horse Chestnut had a volume of 0·10 cu.m. against 0·11 cu.m. for Ash. The remaining Poplars that had developed under the dense shade of the Horse Chestnut had straight and clear boles. The Horse Chestnut appears to grow particularly well in the Vojvodina and its planting in mixture with Poplar is recommended.

5010. ENGLE, L. G. **Growth of upland hardwoods in southern Indiana.** *Sta. Note Cent. St. For. Exp. Sta.* No. 127, 1959. pp. 2.

Data from plots established in 1946 in uneven-aged stands of Oak/Hickory and of mixed hardwoods (Sugar Maple, Ash, Beech, Hickory etc.) showing an 11-year m.a.i. of 246 and 227 bd.ft./acre respectively, indicate a very good growth potential but, as diam. growth rates are relatively low and mortality high, a heavy improvement felling favouring the better species is called for.

5011. APPLEQUIST, M. B. **Growth of planted Cherrybark Oak [*Quercus falcata* var. *pagodaefolia*] in Southeastern Louisiana.** *LSU For. Notes La. agric. Exp. Sta.* No. 26, 1959. pp. 2.

Gives data on height growth for the first 6, first 9, and 6th to 9th years, when survival was 93%.

5012. ISSA, R. Determinaciones del crecimiento de eucaliptales en terrenos bajos y endicados, del delta del Paraná, Argentina. **[The growth of Eucalypts on low-lying and reclaimed land in the Paraná Delta, Argentina.]** *Rev. for. argent.* 3 (1), 1959 (3–9). [Span.]

A survey of plantations covering ca. 3400 ha., established in Entre Ríos on the shores of a branch of the Río Paraná, by an undertaking dependent on the Ministry of Fuel and Power. The plantations, destined for the production of mining timbers, consist mainly of *Eucalyptus tereticornis* in irregular mixture with *E. rostrata*, and also of some *E. saligna*. Notes are presented on climate and soils, and methods used in raising plants and establishing plantations. Measurements were made in 1958 on sample plots averaging 0·125 ha., and ranging in age from 5 to 8 years. In general, growth is poor, the m.a.i. of exploitable timber seldom exceeding 12 cu.m./ha. Best growth was made on the higher embankments were soils are deeper and injurious salts absent.

561. Increment in Height, Diameter, Basal Area, Form and Quality. Variations and Trends; Dendrochronology

See also Nos. 4297, 4300, 4302.

5013. ECHOLS, R. M. **Evaluating trees and stands from large increment cores.** *Proc. Soc. Amer. For.* 1958 (1959), (145–8). 2 refs.

Two cores, 10 mm. wide, taken from opposite sides of a tree are used to determine not only ring width, but also fibre length and sp.gr. (and hence quality) of pulpwood trees. Sp. gr. is either found as a weighted average of a series of 2-in. sections into which the core is cut, or taken from the second 2-in. section from the pith, as these were found to approximate closely to the weighted mean. One application was a study of spacing in Loblolly plantations, which indicated that within the range tested (4 × 4–10 × 10 ft.) spacing had no significant effect on sp. gr.

5014. PATTERSON, A. E. **Distinguishing annual rings in diffuse porous tree species.** *J. For.* 57 (2), 1959 (126).

The annual rings of increment cores soaked in solutions of phloroglucinol and HCl (1 min. each) become much more evident, and are readily distinguished under fluorescent light. [Cf. *F.A.* 19 No. 805.]

5015. GINDEL, J. Una analisi dei cerchi annuali legnosi di specie forestali italiane. **[Analysis of growth rings of wood of Italian forest species.]** *Monti e Boschi* 10 (4), 1959 (156–64). 17 refs. [It.f.e.]

A study with increment cores to determine the relation between climatic factors and diameter increment of *Abies alba*, *Picea abies*, *Larix decidua*, *Pinus sylvestris*, and *P. nigra* vars. *austriaca* and *calabrica* growing at Vallombrosa. Direct and significant correlations were found to exist between width of growth ring of *A. alba* and rainfall for July-August and for June-July-August.

5016. **Annual growth patterns of Ponderosa and Sugar Pine.** *Calif. For. & For. Prod. Calif. For. Prod. Lab.* No. 10, 1959 [3].

Study of increment cores and internodal length from Pines growing under conditions typical of the second-growth mixed conifer type showed: (1) a strong tendency for both Pines to grow least in diameter on the S., and most on the N. side; (2) a sharp reduction in diam. growth during the two years of cone production when Ponderosa Pine <50 years of age produced a heavy cone crop; (3) a relatively constant rate of diam. growth over the last 30 years for isolated residual Pines >150 years old; (4) a fairly constant pattern of internodal length among all trees measured.

5017. FRITTS, H. C. **The relation of radial growth to maximum and minimum temperatures in three tree species.** *Ecology* 40 (2), 1959 (261–5). 9 refs.

During the growing season of 1957, daily radial growth was measured in two White Oaks (*Quercus alba*) and one Sugar Maple (*Acer saccharum*) with the Fritts Dendrograph [cf. *F.A.* 17 No. 3124], and the records punched on IBM cards along with daily maximum and minimum temperature, daily rainfall, the solar radiation of 1, 2, 3, 4, and 5 days previous to growth, vapour pressure deficit, and time in number of days from the beginning of the growing season. Results showed that radial growth in both species is influenced more by the maximum than the minimum temperatures, and that the two species are differently affected by changes in the maximum temperature: high maximum temperatures appear to be more limiting to radial growth of the Sugar Maple, while low maximum temperatures appear to be more limiting to radial growth of the White Oaks. Results are compared with similar data for Beech [cf. *F.A.* 20 No. 3594].

5018. BELYEA, H. C. **Two new formulae for predicting growth percent.** *J. For.* 57 (2), 1959 (104–7). 4 refs.

Proposes the geometric growth percent formula: $P = [(S' - s)/\sqrt{S' \cdot s}] \times 100/n$, where s and S' are the volume at the beginning and end of the period n (in years); and the organic growth percent formula: $P = 2{\cdot}3\ (\log S' - \log s) \times 100/n$. The merits of the two formulae are discussed in relation to the conventional compound interest and Pressler formulae, and values for the growth % of Spruce in the Adirondacks as calculated by all four formulae are compared, to the chief disadvantage of Pressler's.

562. Volume Increment

See also No. 4371.

5019. PATRONE, G. Su una proprietà delle curve di massa delle fustaie coetanee. **[A property of volume curves of even-aged stands.]** *Ital. for. mont.* 14 (1), 1959 (38–41). [It.f.]

Compares the curves obtained by plotting volume against age, (*a*) on ordinary and (*b*) on logarithmic paper. In the first case the curve is more or less S-shaped, in the second it is constantly concave to the axis of abscissae. The position on both curves of the point t (age of maximum volume m.a.i.) is discussed.

5020. ČOKL, M. O poenostavljenih metodah za meritev prirastka. **[Simplified methods of measuring increment.]** *Gozd. Vestn.* 17 (3), 1959 (65–82). 12 refs. [Sloven.g.]

Describes in detail a method of obtaining the 'tariff' difference % [cf. *F.A.* 16 No. 4411], i.e. the increment % corresponding to a d.b.h. increment of 1 cm. A table is presented from which the volume increment % can be obtained from the diameter increment, for all types of stand and for all the main tree species. The possibilities are discussed of using Bitterlich's Relascope to select the trees to be measured for d.b.h. increment.

5021. BENIĆ, J. Određivanje tečajnog prirasta u visokim regularnim (jednodobnim) šumama. **[Determining current increment in even-aged high forest.]** *Šum. List* 83 (1/3), 1959 (54–6). [Croat.]

Suggests a method for Jugoslavian forests of taking the m.a.i. (i.e. total volume divided by age) and multiplying it by the *K* factor (viz. the relationship of c.a.i. to m.a.i.) for the relevant age and site class, obtained from German yield tables.

5022. KOSONOGOV, P. Metod određivanja prirasta prebirnih šuma. **[A method of determining the increment of selection forest.]** *Šumarstvo* 11 (9/12), 1958 (653–5). [Serb.]

Outlines briefly the general principles of a method proposed by the author, based on increment tables for trees of different d.b.h., height and crown vigour.

5023. BOROWSKI, M. Metody oznaczania bieżącego przyrostu miąższości drzewostanu na podstawie przyrostu pierśnicy. **[Methods of determining the current volume increment of stands from the diameter increment at b.h.]** *Zesz. nauk. Szkoł. Gospod. wiejsk. Warsz.* (*Leśn.*) No. 1, 1958 (95–182). 15 refs. [Pol.russ.]

An elaboration and extension of earlier work [cf. *F.A.* 16 No. 3274].

5024. WENGER, K. F., *et al.* **The relation of growth to stand density in natural Loblolly Pine stands. Five-year results.** *Sta. Pap. Stheast. For. Exp. Sta.* No. 97, 1958. pp. 10. 7 refs.

A first report on a study on 153 circular ¼-acre plots in 20- to 60-year stands in Georgia, Virginia and N. Carolina, varying widely in site class and density. About 35% of the plots were thinned to prescribed densities. In all these, and in unthinned young plots, volume increment increased with density on good, but declined on poor sites, while in older unthinned plots it increased on all sites, but less so on the poor ones.

5025. GRUSCHOW, G. F., and EVANS, T. C. **The relation of cubic-foot volume growth to stand density in young Slash Pine stands.** *For. Sci.* 5 (1), 1959 (49–55). 2 refs.

Using data from 69 plots in the 10- and 20-year classes, on sites with indexes 50–100, and densities (% of theoretical full stocking) of 10 to 130 [see *F.A.* 11 No. 1043], regressions for the 5-year vol. p.a.i. of trees >3·5 in. d.b.h. and for diam. m.a.i. of the 100 largest trees/acre are developed, illustrated and discussed.

566. Yield Tables and Their Construction

See also Nos. 4993, 4996.

5026. HENGST, E. Der Ertragsleistung der Kiefer in Ostthüringen. **[The yield of Scots Pine in East Thuringia.]** *Arch. Forstw.* 7 (9), 1958 (653–702). 20 refs. [G.g.russ.e.]

The author recalls that E. Münch (1924) recommended separate German yield tables for (*a*) the S.W. plains, (*b*) the middle and south of the central mountains, (*c*) north and central plains, (*d-f*) 3 small areas in the Bavarian Alps. The present study develops, from 96 plots heavily thinned from below, a yield table, with detailed supporting data, for a race intermediate between mountain and plain forms in the natural range of *Pinus sylvestris hercynica*, the Central German mountain race. A comparison with E. Wiedemann's 1948 table [see *F.A.* 13 No. 1995], for which correction factors are tabulated, shows that site class can be read direct, and growing stock enumeration requires a few unimportant corrections, but that there are wider deviations in increment and intermediate yield volumes.

569. Increment; Development and Structure of Stands: Miscellaneous

See also Nos. 4285, 4516.

5027. OVINGTON, J. D., and MADGWICK, H. A. I. **The growth and composition of natural stands of Birch. 1. Dry matter production.** *Plant & Soil* 10 (3), 1959 (271–83). 8 refs.

In this study, 2 sample trees of *B. verrucosa*, with height, g.b.h. and crown dimensions closest to the plot means, were selected from each of 9 naturally colonized plots, aged 6 and 24–55 years (here treated as a development series), and the dry weights of leaf, branch, bole and roots determined (the last for 4 trees and to 0·5 cm. diam. only). On this rich fen peat, canopy was closed at 6 years (10,450 stems/ha.). The mortality trend is 50% every 10 years, *B. pubescens* (the shorter-lived) yielding dominance to *B. verrucosa*. From the pole stage on, branch number tends to remain at 50, though crown length increases, while leaves increase, with age, in number, weight and area. The bole weight c.a.i. greatly increases after ca. 20 years and appears to decrease after 55, when trees approach maximum height. Correlation coefficients for total dry weight of aerial parts on d.b.h. and height were both >0·99. Of this weight, leaves were 1–2% and branches 18% in mature trees. Root/shoot weights were as 1/3 or 4. The difference between gross (cumulative) matter production and the current weight of the tree increases with age, the gross production of leaves and branches at 55 years being respectively ca. 14 and 1·7 times their weights on the standing tree. As regards crop data the continued increase of gross branch weight contrasts with that of even-aged planted Scots Pine [cf. *F.A.* 19 No. 2163], which shows no increase after 20 years, indicating fundamental differences in branch habit and growth. The Birch crop leaf-weight increases at full stocking to >2000 kg./ha. at age 24, thereafter showing the (temporary) decline noted in Finland [cf. *F.A.* 18 No. 745]; older crops had 700–2500 kg. During the period of rapid growth, the dry matter c.a.i., excluding roots, was ca. 7900 kg./ha. (leaves 1·4, branches 1·9 and bole 4·6 thousand kg.), the relative constancy of the figure after canopy closure indicating full use of the site. The corresponding figure of 19,000 kg./ha. for Scots Pine and other conifers is attributed to the greater weight and area of their leaves and their longer photosynthetic activity. In Birch 19% of total dry-matter production and in Scots Pine 32% is represented by foliage. Birch crop leaf-area varies during the relatively constant increment period of rapid growth, indicating a variation of leaf efficiency. Dry matter production p.a. varied from 0·06 to 0·61 (mean 0·24) kg./sq.m. of leaf, equal to 9 g./sq.m./week, assuming a 6-month season. [Cf. *F.A.* 20 No. 4120.]

5028. Étude des bambous. (1) *Oxytenanthera abyssinica*. (2) *Bambusa vulgaris*. **[A study of Bamboos. (1) *O. abyssinica*. (2) *B. vulgaris*].** *Rapp. Inst. nat. Étude agron. Congo belge 1957*, 1959 (129–30). [F.]

(1) Measurements were made on a plot of *O. abyssinica* left unfelled for 35 months. The 37 clumps harvested yielded 875 culms, total green weight 1929 kg., mean diam. 3·04 cm., and mean height 6·36 m. Twigs and leaves made up 82·5% of the green weight, and dry weight was ca. 47% of green weight. (2) *B. vulgaris*. Observations were continued on 20 vigorous and 20 poorly developed clumps on 4 plots. Shoots are produced throughout the year, but 65% of shoots appear in two periods, viz. April-June and Nov.-Jan. Mean annual yield of culms/ha. (dry weight) was 13,919 kg., but there was considerable difference between plots (13,830; 13,786; 16,428; and 11,632).

58. Surveying and Mapping. Aerial Survey

See also Nos. 4728, 4966, 5363.

5029. AVERY, G. **Photographing forests from helicopters.** *J. For.* 57 (5), 1959 (339–42). 6 refs.

Discusses the advantages of helicopters over fixed-wing aircraft, and the problems associated with their use: vibration, and the necessity for lightweight camera equipment and accurate altimeters. Also describes the use of single prints for tree measurements and of stereo-pairs for stand measurements.

5030. WILLINGHAM, J. W. **Obtaining vertical aerial photographic coverage with a 35 mm. camera.** *J. For.* 57 (2), 1959 (108–10).

Gives full information on the camera, film, filter, aperture and shutter speed, camera mount, aircraft, and flight and dark-room procedures.

5031. BERNSTEIN, D. A. **Does magnification improve measurements of stand heights on aerial photographs?** *For. Chron.* 34 (4), 1958 (435–7). 7 refs.

A study recently carried out by the U.S. Forest Service at Portland, Ore., indicated that increased magnification does not give increased accuracy in tree-height measurement.

5032. SWELLENGREBEL, E. J. G. **On the value of large scale aerial photographs in British Guiana forestry.** *Emp. For. Rev.* 38 (1), 1959 (54–64). 8 refs.

Aerial photographs on a scale of 1:10,000 were taken of a virgin forest area in the Essequito-Mazaruori watershed for experimental purposes. Tree d.b.h. measured in the field is correlated with crown diam. (c.d.) of the same tree measured on the photographs, a linear relation between these two measurements being established mathematically. The possibilities of volume estimation through c.d. measurements on aerial photographs are discussed and an indication is given of which vegetation types this method will be most successful with. *From author's summary.*

5033. ROSAYRO, R. A. DE. **The application of aerial photography to stockmapping and inventories on an ecological basis in rain forest in Ceylon.** *Emp. For. Rev.* 38 (2), 1959 (141–74). 35 refs.

Describes aerial photography, scale 1:15,840, over 24,000 acres in the Sinharaja forest, Ceylon, with an altitudinal range of 300–3800 ft. The stratification obtained by photography was found to have a close relationship to previously recognized ecological types [cf. *F.A.* 15 No. 3397], chiefly the *Mesua*/*Doona*/*Shorea* climax community and its softwooded faciation (*Cullenia*/*Palaquium*/*Doona congestiflora*). The ecological relationships of the major types are discussed. The evidence of the spatial distribution of the chief species in relation to regeneration, especially of *D. congestiflora*, appears to give support to the possible occurrence of a cyclical or recurrent space-time pattern in the region. There is also a strong correlation between the presence of certain specialized types and the peculiar geological features of the region. The application of these results to further work is discussed and the most suitable sampling procedures are indicated. *From author's summary.*

5034. LANGLEY, P. G. **Aerial photography as an aid in insect control in Western Pine and mixed conifer forests.** *J. For.* 57 (3), 1959 (169–72).

On the basis of practical experience, discusses the relative merits (including costs) of (*a*) panchromatic, (*b*) infra-red, (*c*) camouflage detection, (*d*) aero Ektachrome, and (*e*) negative colour, films in determining the extent of insect attack. In general, (*a*) and (*b*) should not be used except in case of heavy, easily discernible infestations; (*c*) and (*d*) are recommended, at scales of 1:10,000 or 1:12,000 for photographing large, and 1:5000 or 1:8000 for small timber, except where detailed analysis of individual crowns is required (1:2500). Only preliminary tests have so far been made with (*e*), but results were very promising.

5035. JEWESSON, R. **Technical note: Some applications of aerial photographs.** *For. Chron.* 35 (1), 1959 (67–71).

Describes the use of aerial photos (1) for estimating volumes of logs in a booming ground, and (2) for planning slash-burning operations.

6. FOREST MANAGEMENT. BUSINESS ECONOMICS OF FORESTRY. ADMINISTRATION AND ORGANIZATION OF FOREST ENTERPRISES

See also Nos. 4037, 4965.

62. Working Plans. Annual or Periodic Yield. Yield Regulation

See also Nos. 4371, 4374

5036. HENRY, J. L. **What is a management plan?** *Aust. Timb. J.* 25 (1), 1959 (7, 9, 93 . . . 110).

[Cf. *F.A.* 19 No. 839.] An exposition of the making and implementation of a working plan, drawing on data from the Kendal management area, N.S.W., where forests containing high-quality *Eucalyptus pilularis* amount to 50,000 acres. Group selection with natural regeneration, and yield control by the recruitment method [modified Brandis?], with rotations of 70–80 and felling cycles of 10 years are being applied. A sustained yield of sawlogs of 20 in. diam. is the main object.

5037. HALLIN, W. E. **The application of unit area control in the mangement of Ponderosa-Jeffrey Pine at Black Mountains Experimental Forest.** *Tech. Bull. U.S. Dep. Agric.* No. 1191, 1959. pp. 96. 32 refs.

Describes in detail the virgin *Pinus ponderosa/P. jeffreyi* forest at the time it was established as an experimental forest 30 years ago, and the problems involved and methods employed in converting it to managed forest. The method of management, 'unit-area control', involves detailed control of stocking on small homogeneous natural areas in the forest [cf. *F.A.* 13 No. 1456].

5038. SUSMEL, L. Riordinamento su basi bioecologiche delle faggete di Corleto Monforte. **[Working-plan revision, on an ecological basis, for the Beech woods of Corleto Monforte [S. Apennines, Province of Salerno].]** *Pubbl. Staz. sper. Selv. Firenze* No. 11, 1959. pp. viii + 174 + map. Many refs. [It.f.]

On the same lines as the same author's earlier publication on mixed stands in the Alps [see *F.A.* 18 No. 800], giving (1) detailed description of sites, soils, vegetation etc., (2) history and present condition of the stands, (3) revision of the working plan, including conversion of Beech coppice to high forest of Oak and Pine. [Cf. *F.A.* 18 Nos. 1993, 3881.]

64. Forestry as a Business: General

See also No. 4371.

5039. WORRELL, A. C. **Economics of American forestry.** John Wiley & Sons, Inc., New York; Chapman and Hall Ltd., London. 1959. pp. x + 441. Many refs. Price £3. 18*s*.

Chiefly designed as a textbook for the American college student, using an analytic rather than a descriptive approach, but adducing many data on U.S. forestry and forest products, demand and supply, capital and labour, wages, prices, etc.

5040. BARRADAS, M. J. DA M. ANTUNES. Serões com o subericultor. Avaliações de montados e de cortiças. **[Discussions with cork growers. The evaluation of stands and of cork production.]** Direcção Geral dos Serviços Florestais e Aqüicolas, Lisbon. 1958. pp. 243 + 3 plates. 2 refs. [Port.]

A handbook designed to aid the cork grower to deal with the financial aspects of cork production. Methods are expounded and tables and formulae presented for use in making calculations of the following nature: average revenue from established stands, revenue from stands in the making, value of the land and the crop (including the value of the standing trees when the cork has been sold, value of the stand plus that of the cork, value of the felled stand), profits from the sale of the cork, and taxation. Chapters are also included on sustained yield and management.

5041. HOLLOWAY, A. W. **Independent logging on the West Coast.** *Pulp Paper Mag. Can.* 59 (11), 1958 (111–7). 3 refs.

Discusses the effects since 1847 of land tenures, public ownership, growth of large operators, regulations, utilization, management licences etc. on the British Columbia independent logger (classified as small, medium, and large, with investments of ≯ \$100,000, \$400,000 and \$1,000,000 respectively).

65. Special Business Problems of Timber-Growing. Calculations of Costs and Profitability. Valuation

See also Nos. 4353, 4365, 4371, 4403, 4418, 4538, 4553–4, 4936, 5363, 5432.

5042. WILLISTON, H. L. **Cost of pruning Loblolly and Shortleaf Pine.** *Sth. Lumberm.* 198 (2470), 1959 (43).

Pruning to 17 ft. after a first thinning, took ca. 5·1 min./tree in a 17-year Loblolly stand, and 3·5 min. in a 23-year Shortleaf stand, both ca. 40 ft. high, the latter having fewer total and fewer live branches. Costs per tree were 11 and 7 cents respectively, but if the disproportionately difficult top 2 ft. were omitted, they would be considerably less.

5043. REID, J. A. K. **Stumpage appraisals.** *B.C. Lumberm.* 43 (4), 1959 (14 . . . 16).

Outlines the method of calculating the upset stumpage used by the British Columbia Forest Service, which is based on (*a*) enumerations giving volumes by species in log grades, (*b*) the selling prices of these grades ruling at utilization centres for the previous 3 months, (*c*) the operating costs (felling, skidding, boom operations and towing etc.) and (*d*) the allowable profit as a % of total cost including stumpage by a similar method to that used by the U.S. service [cf. *F.A.* 20 No. 2210]. In government contracts a rise and fall clause is now compulsory. It accommodates the actual stumpage paid to variations in log prices during the contract period.

5044. WOOD, R. S., and KER, J. W. **Stumpage appraisal on the U.B.C. [University of British**

Columbia] Research Forest. *J. For.* 57 (5), 1959 (363–5).

Gives details of the method used and its application in practice.

5045. Švec, J. Příspěvek k oceňování lesů podle zásad marxistické ekonomie (Teoretická část). **[Forest valuation according to Marxist economics. (Theory).]** *Sborn. čsl. Akad. zeměd. (Lesn.)* 5 (1), 1959 (29–52). [Cz.russ.e.]

An elaboration of earlier work [see *F.A.* 12 No. 848].

5046. Nymburský, B., and Záruba, C. Ekonomické hodnocení produkčních ztrát, vznikajících působením škodlivých činitelů v lesních porostech. **[Economic evaluation of production losses caused by injurious agencies in forest stands.]** *Zpravy VÚLH, Praha* 3 (1), 1957 (47–54). 24 refs. [Cz.]

Analyses, in a Czech context, quantitative losses caused by premature felling, permanent lowering of yield, temporary lowering of yield, and delayed afforestation, losses in timber quality, and the (15) most important injurious agencies. Examples with Spruce are used to explain how losses are evaluated.

5047. Záruba, C. K otázce vyhodnocení produkčních ztrát, vznikajících odlesněním průseků pro elektrovody. **[Evaluation of the yield losses caused by clearings for powerlines.]** *Sborn. čsl. Akad. zeměd. (Lesn.)* 4 (6), 1958 (491–500). 4 refs. [Cz.russ.g.]

Disagrees with Kudela [cf. *F.A.* 18 No. 830] who calculates losses (say for 50 years) as the difference between the total volume yielded when the powerlines were put up, and the yield expected after 50 years. Instead of this, it is proposed to calculate losses as the sum of the losses caused by premature destruction of the stand, plus the losses from non-afforestation of the clearings for 50 years. Disparities between the results from the two methods are discussed and explained in graphs.

66. Costing of Logging Operations

See also Nos. 4680, 4683–4.

5048. Abbattage au 'treedozer'. **[Felling with a 'treedozer'.]** *Rapp. Inst. nat. Étude agron. Congo belge 1957*, 1959 (197–8). [F.]

A study was made to determine the relative costs of operations using: (*a*) a D7 Caterpillar tractor alone (the method currently used), (*b*) a D9 alone, and (*c*) a D7 first, followed by a D9, the object being to avoid uneconomic use of the D9, a powerful and expensive tractor. The results were as follows: tractor-hours/ha. (*a*) 31, (*b*) 10, (*c*) 19 + 3; man-hours/ha. (*a*) 87, (*b*) 20, (*c*) 20; cost in francs/ha. (*a*) 13,500, (*b*) 10,900, (*c*) 12,100. It is thus apparent that the exclusive use of the D9 (*b*) is the most economical method and represents a financial saving of ca. 29% over (*a*) and 10% over (*c*), besides a substantial saving in labour. All these findings apply only when considerable areas are to be cleared.

5049. Hakkarainen, A. E. Varastot puutavaran autokuljetuksen kustannustekijänä. **[Landings as a cost factor in lorry transport of timber.]** *Tied., Metsäteho, Helsinki* No. 153, 1959. pp. 9. 6 refs. [Fi.e.*e*.]

Presents tabulated results of studies on the distribution of per-trip costs of transport between loading, unloading and driving, and on the effect of different loading and unloading conditions (e.g. poor foundations to landings, the use of mechanical equipment) on per-trip costs.

5050. **Method of calculating the cost of owning and operating a horse on woodlands operations.** *Woodl. Sect. Index Canad. Pulp Pap. Ass.* No. 1837 (*B*-8-*c*), 1959. pp. 3.

67. Assessment of Financial Results: Book-keeping and Accountancy; Business Statistics; Short-Term Planning and Financing

See also Nos. 4365, 4403.

5051. **Woodlands series.** *J. Land Agents' Soc.* 58 (4), 1959 (134–41).

Sets out a costing system for estate woodlands and discusses its advantages.

68. Administration and Organization of Forest Enterprises

684. Labour Management

5052. Kühnle. Arbeitsorganisatorische Betriebsplanung. **[Planning the development of forest labour.]** *Allg. Forstzeitschr.* 14 (25), 1959 (453–7). [G.g.]

Describes the detailed advance planning in terms of man- and woman-days required and available month by month for the work prescribed in the working plans, carried out in 20 N. Württemburg forest districts. This includes an estimate of the development of the labour force and proposals to deal with shortages or surpluses of labour, which has led to useful permanent or temporary transfers from surplus to deficiency districts.

686. Planning and Organization of Buildings, Transport Installations (Roads etc.)

See No. 5047.

7. MARKETING. ECONOMICS OF TRANSPORT AND THE FOREST PRODUCTS INDUSTRIES

See also Nos. 4037, 5039.

5053. **Timber development in the Southern Cameroons.** *Nigeria Trade Journal, Lagos* 7 (2), 1959 (58–61).

Includes data on main species worked, firms operating, licence areas, fees and dues, transport, port and sawmilling facilities, export of logs and lumber etc.

71. Marketing of Forest Products: General

5054. MACGREGOR, J. J. **Are agricultural marketing methods suitable for forestry?** *Quart. J. For.* 53 (2), 1959 (128–38). 5 refs.

Describes the marketing schemes and forms of assistance (e.g. subsidies) given to agriculture in the U.K., and the functions of a commodity commission and of marketing boards, and suggests methods of stabilizing prices in forestry.

5055. ROWLAND, L. **Finding a market for British timber.** *Quart. J. For.* 53 (2), 1959 (106–9).

Discusses the difficulties caused mainly by the falling away of markets for certain kinds of home-grown timber, and suggests ways in which H.M. Government might help British forestry other than by increasing grants paid to woodland owners.

72. The Quantitative Aspects of Marketing. Demand, Consumption and Supply

See also Nos. 4241, 4244, 5060, 5081, 5206–7, 5379, 5406, 5409.

5056. Quadros estatísticos. **[Statistical tables.]** *An. bras. Econ. flor., Inst. nac. Pinho* 10, 1958 (i–xliv). [Port.]

[Cf. *F.A.* 19 No. 2206.] Figures for Brazilian wood production and exports covering chiefly the years 1956 and 1957.

73. Prices

See also Nos. 4991, 5043–4, 5058.

5057. MACGREGOR, J. J. **The preparation of price index numbers for forestry products.** *Forestry* 32 (1), 1959 (39–52). 4 refs.

Only where internal factors are fairly constant can it be assumed that price changes are due to external factors of supply and demand and therefore of economic interest. To devise a satisfactory series of index numbers, the sources of data must be broadly based, a suitable base year must be found, the quality of the product must be reasonably constant, and, when necessary, 'weighting' must be applied. Some series of prices for home-grown forestry products have been tabulated and the intricacies of their preparation are discussed. The series chosen are those thought best qualified to provide a measure of price trend. Four tables have been added to show the relationship between home-grown and imported products. *Author's summary.*

74. Trade Policy

See Nos. 5064, 5379.

75. Trade Customs and Usages

5058. Houtafzet-nummer. **[Timber sale number.]** *Ned. Bosb. Tijdschr.* 31 (3), 1959 (65–106). [Du.]

Includes papers by *J. F. Kools, J. H. van Leeuwen, W. E. Meijerink, H. Veenendaal, J. S. van Broekhuizen*, and *J. van der Valk*, comparing practices in the Netherlands and other W. European countries and giving details of practices, amounts available, prices etc. for different parts of the country.

78. Economics of Transport

5059. MELAMA, N. Uittoyksiköt uittokustannusten jaon kannalta. **[Floating units with reference to the distribution of floating costs.]** *Årsb. Finl. Flottarefören.* No. 27, 1958 (1959), (45–50). [Fi.e.]

Discusses the unit (solid or stacked cu.m.) used on different floating systems, concluding that the stacked cu.m. is suitable for stacked timber in giving a fair distribution of costs among owners, and the volume calculated on top diam. for sawlogs. *From author's summary.*

79. Economics of the Forest Products Industries

See also Nos. 5064, 5209, 5316–9.

5060. PÖNTYNEN, V. Metsäteollisuuden puun käyttö uusimpien tutkimusten valossa. **[The utilization of wood in the Finnish wood industry in the light of recent investigations.]** *Årsb. Finl. Flottarefören.* No. 27, 1958 (1959), (34–44). [Fi.e.]

Discusses the effects on e.g. consumption of smallwood and form of sales, of the increased emphasis on pulpwood production, at the expense of sawlogs, during the 1950s. *From author's summary.*

5061. HANSON, A. G. **Trade associations in the Australian timber industry.** *Aust. For.* 22 (1), 1958 (4–9).

5062. **Organisation for European Economic Co-operation: Small pulp mill survey. Economic study: United Kingdom by Sandwell & Co. Ltd., Vancouver, Canada.** H.M. Stationery Office, London. 1959. pp. 43. Price 4*s*.

A report on studies made on the feasibility and economy of establishing small-scale pulp mills in the U.K. It includes capital costs, manufacturing costs, and gross earnings calculated for plants manufacturing softwood pulp—(1) bleached sulphate (flash dried), (2) groundwood pulp (flash dried) and (3) groundwood pulp (integrated).

8. FOREST PRODUCTS AND THEIR UTILIZATION

5063. **Research—insurance for the future.** *For. Prod. J.* 8 (10), 1958 (37*A*–48*A*).

Four articles, discussing the role of wood research for national security (*G. H. Roderick*) and the part played, in forest products research, by the Federal Government (*V. L. Harper*), private industry (*W. Patnode*), and educational institutions (*H. L. Shirley* and *E. C. Jahn*). This last paper, based on a questionnaire to accredited and non-accredited forestry schools, agricultural and engineering colleges, etc., gives figures on the growth and relative proportion of forestry and forest products research over the last decade, the source of funds, types of projects etc., The cost of training a Ph.D. in a graduate school is estimated at $36,000. [Cf. *F.A.* 17 No. 1108.]

5064. REECE, P. **Aim of timber development in U.K.** *Timb. Tr. J.* 229 (4309), 1959 (63–4).

Steps in the plan outlined to the West European Timber Information Institute's third conference at Amsterdam are: (*a*) the understanding of the properties of the raw material; (*b*) the study of modern social, economic and industrial requirements affecting timber utilization; (*c*) research into design, processing and assembly techniques adapted to (*b*); (*d*) the dissemination of the results of research, particularly in design, for translation into terms of production ; (*e*) the adaptation of existing industries and the erection of new ones, where necessary, for the new technical developments; (*f*) the elimination or use of waste; (*g*) publicity and marketing.

5065. SCOTT, C. W. Informe al gobierno de Chile sobre la enseñanza y la investigación en el aprovechamiento de los productos forestales. **[Report to the government of Chile on teaching and research in the utilization of forest products.]** Expanded Technical Assistance Program, FAO, Rome. *FAO Report* No. 865, 1958. pp. 40. [Span.] Limited distribution.

(1) Reports on training at the Forestry School, University of Chile, Santiago, the Forestry School, Universidad Austral, Valdivia, the School of Wood Technology, University of Concepción, the Experiment Station of La Corfo, Los Lagos, near Valdivia, and the FAO Forestry Centre at Llancacura. (2) makes recommendations for research on *Pinus radiata* and other species (particularly native hardwoods), with particular reference to seasoning, grading, preservation and defects; and (3) reports on the commercial possibilities of the principal Chilean forests. Appendices present (*a*) recommendations for the preservation of timber in Chile, and (*b*) a comparison of site classes of *P. radiata* grown in Chile and New Zealand.

5066. ELLIOT, C. S. Informe al Gobierno de la República Argentina sobre el aprovechamiento de la madera de eucalipto. **[Report to the Government of Argentina on the utilization of Eucalypt wood.]** Expanded Technical Assistance Program, FAO, Rome. *FAO Report* No. 983, 1959. pp. 20. 26 refs. [Span.] Limited distribution.

Covers durability (differences between Australian and Argentine conditions), preservation, sawing, seasoning, and uses (actual and potential).

810. General Information on Woods

See also Nos. 4204, 4212, 4214–6, 4226, 4232, 4237, 4239–40, 4243–4, 4246, 5008, 5206.

5067. **Report on the properties of four different provenance consignments of Sitka Spruce.** Forest Products Research Laboratory, Princes Risborough. 1958. pp. 20.

Five trees, 30 years old, grown in Radnorshire were tested from each of 4 provenances, viz. (1) Queen Charlotte Islands, (2) Mt. Olympus, Wash., (3) Suislaw, Oreg. and (4) Siskiyan, Cal. Timber from (1) had the highest density and highest quality; differences in density between trees from the other 3 sources were not significant though (3) was rather less dense than (2) or (4). Trees from (3) were most subject to drought crack but there was little difference between provenances in seasoning collapse. It is concluded that seed from northern provenances, especially that from (1) is preferable as regards timber quality for use in the U.K.

5068. **Properties of thinnings of home-grown Norway Spruce (*Picea abies*). Progress report 4—Consignment No. 961.** Forest Products Research Laboratory, Princes Risborough. 1959. pp. 5 + 2 tbls., 2 photos. Limited distribution.

Material studied consisted of 5 trees, 35 years old, from Hazelborough Forest, Northants. [Cf. *F.A.* 19 No. 4713.]

5069. **Properties of thinnings of home-grown Grand Fir (*Abies grandis*). Progress report 3—Consignment No. 948.** Forest Products Research Laboratory, Princes Risborough. 1959. pp. 7 + 1 tbl. Limited distribution.

[Cf. *F.A.* 17 Nos. 3183–4.] Material in this consignment consisted of 5 trees, 30 years old, from a mixed Grand Fir and Western Hemlock compartment, in the Dovey Corris Forest, Montgomery and Merionethshire.

5070. **Properties of thinnings of home-grown Noble Fir (*Abies procera*). Progress report 1—Consignment No. 950.** Forest Products Research Laboratory, Princes Risborough. 1959. pp. 7 + 3 photos.

Material studied consisted of 5 trees, 30 years old, from Dovey Forest, Merionethshire.

5071. **Properties of thinnings of home-grown Corsican Pine (*Pinus nigra* var. *calabrica*). Progress Report 2. Consignment No. 962.** Forest Products Research Laboratory, Princes Risborough. 1959. pp. 12 + 3 tbls., 9 photos.

[Cf. *F.A.* 16 No. 4460.] Presents results of tests on 20 trees, 54 years old, from Weeting Forest, Thetford Chase, Norfolk, giving details of the site and stand condition.

5072. **Properties of thinnings of home-grown Western Hemlock (*Tsuga heterophylla*). Progress Report 3—Consignment No. 949.** Forest Products Research Laboratory, Princes Risborough. 1959. pp. 6 + 1 tbl., 3 photos.

[Cf. *F.A.* 19 No. 4715.] Presents results of tests on five 29-year trees from Dovey Corris Forest, giving details of site and stand condition.

5073. **Specimen woods Nos. 279–282.** *Suppls.* to *Wood* 24 (3–6), 1959. Each pp. 2.

Saligna Gum (*Eucalyptus saligna*); Pillarwood (*Cassipourea malosana*, syn. *C. elliottii*); Radiata Pine (*Pinus radiata*); and Yellow Stringybark (*Eucalyptus acmenioides*).

5074. Arkwright, P. **Know your timber: Nos. 60–63.** *Woodwkg. Ind.* 16 (3–6), 1959 (151; 209; 269; 325). P.R.

Black Cabbage Bark (*Andira inermis*); Vinhatico (*Plathymenia reticulata*); Canarium (*Canarium* spp.); and Blackbutt (*Eucalyptus pilularis*).

5075. **Specifications of hardwood joinery.** English Joinery Manufacturers' Association, London. 1958. pp. 8. P.R.

Intended as a brief guide to architects, the memorandum lists 35 lesser known imported hardwoods giving their common and scientific names, together with details of their durability, price, workability and availability as commercially produced plywood and veneer.

5076. **[Outline of important Japanese woods.]** *Suppls.* to *Wood Ind., Tokyo* 14 (2; 3), 1959. Each pp. 2. [Jap.] P.R.

Each includes 3 photomicrographs of the wood and tabulated data on its physical and mechanical properties. The species here covered are *Aesculus turbinata* and *Morus bombycis*.

5077. Goonewardene, W. E. S. **Notes on Ceylon timbers: *Anogeissus latifolia* Wall.** *Ceylon For.* (*n.s.*) 3 (2), 1957 (187–8). 5 refs.

5078. Sriburi, T. **[Thai reserved timbers. [Description of] the wood of reserved [forest] species of Siam.]** *Vanasarn* 16 (2), 1958 (69–72); 17 (2), 1959 (31–4). [Siam.*e*.]

[Cf. *F.A.* 20 No. 3642.] *Gmelina arborea*, *Pterocarpus macrocarpus*, *Sterculia campanulata*, *Afzelia xylocarpa*, *Shorea* sp., *Azadirachta indica*, and *Pentace burmanica*.

5079. Drei weitere Gabun-Hölzer. **[Three further timbers from Gabon.]** *Holz- Zbl.* 85 (34), 1959 (430). 4 refs. [G.]

A description of Andoung (*Monopetalanthus heitzii*), Ekop (*Tetraberlinia bifoliolata*) and Igaganga (*Pachylobus edulis*), including nomenclature, provenance, habit, timber properties and uses.

5080. Mainieri, C. Madeiras do Brasil (2ª contribuição). Sua caracterização, usos comuns e índices qualitativos físicos e mecânicos. **[Brazilian timbers (2nd contribution): description, common uses, and physical and mechanical properties.]** *An. bras. Econ. flor., Inst. nac. Pinho* 10, 1958 (339–444). [Port.] (Also as *Publ. Inst. Pesqu. tec. S. Paulo* No. 573, 1958. pp. 108.)

[Cf. *F.A.* 19 No. 2230.] Presents information on a further 50 species.

5081. Maderas. **[Woods.]** Corporación Chilena de la Madera, Santiago. [*n.d.*] pp. 72. 2 refs. [Span.]

Part I: General aspects of the Chilean forest industry (area of forest, standing volume, exports etc.). Part II: Timber technology (wood structure and physical, mechanical and chemical properties). Part III: Chilean timbers (native and scientific names, structure, weights, mechanical strengths, description, uses). Part IV: Grading and measurements (usual sawn timber dimensions, definitions of technical terms, grading rules, volume measurement of round and sawn wood). An appendix contains tables for converting to board feet log volumes calculated on length in (*a*) 'varas' (ca. 2·8 ft.) or (*b*) metres, and diam. in inches.

5082. Kukachka, B. F. **Primavera, *Cybistax donnell-smithii* (Rose) Siebert.** *Rep. U.S. For. Prod. Lab., Madison* No. 2021 (rev.) 1958. pp. 7 + 7 tbls. 4 refs. P.R.

5083. Gerry, E. **Koa or Koa-Ka, *Acacia koa* A. Gray.** *Rep. U.S. For. Prod. Lab., Madison* No. 2023, 1955. pp. 8. 24 refs.

5084. Gerry, E., and Drow, J. T. **Pyinkado, Pyingado, *Xylia dolabriformis* Benth. (= *Mimosa xylocarpa* Taub.).** *Rep. U.S. For. Prod. Lab., Madison* No. 1938, 1953. pp. 5 + 1 tbl. 18 refs.

5085. Kukachka, B. F. **Angelique, *Dicorynia guianensis* Amsh.** *Rep. U.S. For. Prod. Lab., Madison* No. 1787 (rev.) 1958. pp. 8 + 4 tbls. 7 refs.

5086. Kryn, J. M. **Spanish Cedar, *Cedrela* spp.** *Rep. U.S. For. Prod. Lab., Madison* No. 1948 (rev.) 1957. pp. 6 + 2 tbls. 13 refs. *Rep. U.S. For. Prod. Lab., Madison* No. *R* 1948, 1953 revised.

811. Structure, Identification

See also Nos. 5013–4, 5163.

5087. Glossário internacional dos termos usados em anatomia de madeiras—versão portuguesa. **[International glossary of terms used in wood anatomy—Portuguese translation.]** *Estud. Ensaios e Docum. Junta Invest. Ultramar, Lisboa* No. 46, 1958. pp. 91. [Port.]

A Portuguese version of the international glossary [see *F.A.* 19 No. 2243] giving (1) English terms with Portuguese equivalents, and (2) definitions of the terms in Portuguese.

5088. Powney, T. J. **Technical note. A model to illustrate the structure of a softwood.** *J. Inst. Wood Sci.* No. 2, 1958 (76–7).

A 6 × 6 × 11-in. instructional model carved out of natural wood was devised to illustrate the microscopic structure of a softwood. The top of the model shows the transverse section, with radial rows of tracheids. One side opens like a door to display a radial view, also showing the pitting of the ray cells and vertical tracheids. Certain tracheids are removable and some are cut away to reveal the structure of a pair of bordered pits, the pit membrane being represented by a piece of exposed X-ray film; also shown are various types of pitting on a radial tracheid wall, with pits coinciding with those of the ray cells.

5089. Page, D. H., and Emerton, H. W. **The microscopic examination of fibres, paper, board and wood. Part I. Improved methods for the study of surfaces.** *Svensk PappTidn.* 62 (9), 1959 (318–32). 16 refs. [E.e.sw.g.] P.R.

Describes metal shadowing methods, best used for the study of opaque materials in conjunction with replica methods, and illustrates with photomicrographs the results obtained.

5090. Ferreirinha, M. P. Identificação de uma madeira angolana, *Morus lactea* (Sim) Mildbr. **[Identification of an Angolan timber, *M. lactea*.]** *Garcia de Orta, Lisboa* 6 (2), 1958 (283–300 + 10 plates). 7 refs. [Port.e.]

Presents an anatomical study of the wood of *Morus lactea* from Angola and, at the same time, data on the woods of the following species that tend to be confused with wood of *M. lactea*: *Enantia* spp., *Nauclea* (*Sarcocephalus*) *diderrichiana*, and *Chlorophora excelsa*. A table of comparisons is included.

5091. Fahn, A. **Xylem structure and annual rhythm of development in trees and shrubs of the desert.** *Bull. Res. Coun. Israel 7D* (1), 1959 (23–8). 3 refs.

[See *F.A.* 20 No. 3663.] The wood anatomy and annual development rhythm of *Acacia tortilis* and *A. raddiana*, and seasonal changes in their starch content are described. Both timbers are diffuse-porous with indistinct rings, having vessels solitary or in multiples of 2, 3, or 4, or in large clusters. Intervascular vestured pits were seen in both. Rays are homogenous. Fibre walls include inner gelatinous layers. *A. raddiana* is distinguished by broader concentric bands of wood parenchyma. The cambium in both remained active throughout the year. A prominent starch-free zone in the xylem periphery could be observed only when the cambium was very strongly active.

811.1. Anatomical Elements and Tissues

See also Nos. 4800, 5121–5, 5144–5, 5170, 5306, 5320, 5322, 5325–6.

5092. Krasnitskij, A. M. Anatomičeskoe stroenie drevesiny jasenja obyknovennogo semennogo i poroslevogo proishoždenija v svjazi s ontogenezom dereva. **[The anatomical structure of the wood of *Fraxinus excelsior* of seedling and coppice origin in relation to the ontogeny of the tree.]** *Dokl. Akad. Nauk SSSR* 119 (2), 1958 (379–81). 3 refs. [Russ.] A.P.B.

Gives the results of a study of wood samples taken at breast height from 90-year-old trees of *F. excelsior* in the Tellerman forest, including 3 trees of seedling origin (*a*), and 3 representing first-generation coppice (*b*), the true tree age of the latter being 20–30 years greater than that of (*a*). In early wood of (*a*), the vessel lumina were narrower but the number of vessels per sq. mm. was greater, than in that of (*b*), so that the porosity due to vessels was practically the same in both groups. The diameter and lumen diameter of fibres were also smaller in (*a*), but again the porosity due to fibres was not significantly different in (*a*) and (*b*). From the 20th to the 80th ring, (*a*) showed a steady increase in vessel lumen diameter to approximately the value found in (*b*) at the 20th ring. In (*b*) the vessel lumen diameter increased until the 60th ring and then declined, an effect possibly attributable to greater total age of the trees.

5093. Wardrop, A. B. **The organization of the primary wall in differentiating conifer tracheids.** *Repr.* from *Aust. J. Bot.* 6 (4), 1958 (299–305 + 3 plates). 34 refs.

In a study of differentiating tracheids of *Pinus radiata*, evidence has been obtained which suggests that, in those cells with localized apical growth, surface enlargement takes place by the multi-net mechanism of wall growth. Features described, such as the difference in microfibril orientation on the inner and outer surfaces of the cell-wall and the existence of well-developed corner thickenings, closely resemble similar features in elongating coleoptile parenchyma. It is argued that growth is not limited to the extreme tips of the cells as in root hairs, but that the growth zone extends some distance back from the cell ends. *Author's summary.*

5094. **Wood anatomy: structure in relation to growth.** *Rep. Dep. For. Qd. 1957/58*, 1958 (35–6).

Examination of 28-year *Araucaria cunninghamii* from a plus stand gave the following results. Tracheid length in the last formed zone rises to a peak at a certain height and then decreases towards the top of the stem. The maximum length occurs at different heights in different trees but, in the trees observed, is always found in the lowest third of the stem. In the zone immediately surrounding the pith, length of tracheid varies little with increasing height.

5095. Jackson, L. W. R., and Greene, J. T. **Tracheid length variation and inheritance in Slash and Loblolly Pine.** *For. Sci.* 4 (4), 1958 (316–8). 7 refs.

Measurements of tracheid length were made on the wood in the first ring from the pith in single branches from 7 *Pinus elliottii* and 3 *P. taeda* parent trees and 10 open- and 10 cross-pollinated progeny of each parent. It was found that progeny from parents with relatively long tracheids tended to have relatively longer tracheids than progeny from parents with relatively short tracheids. In all except one of the crosses, the tracheid length of the progeny was much closer to the tracheid length of the ♀ than the ♂ parent.

5096. Jackson, L. W. R. **Loblolly Pine tracheid length in relation to position in tree.** *J. For.* 57 (5), 1959 (366–7). 5 refs.

Analyses of tracheid-length variation in relation to position in stem and branches showed that, at all heights in the stem of two 24-year-old plus trees, the length increased from the centre outwards. In the first ring from the pith, the length increased slightly to a height of ca. 27 ft., and then decreased to the top; and in each annual ring, tracheid length increased to a certain height (this height increasing from the pith outwards) and then decreased to the top. Length maxima (4·64–5·25 mm.) occurred in the outermost ring. Using fresh experimental material, it was found that the length of stem- and branch-tracheids was highly correlated. There was no significant difference between the mean length of early- and late-wood tracheids in the two trees sampled, nor were the small differences between their lengths *within* a given ring related to the number of the ring (age of growth) or to height in the stem.

5097. KRAMER, P. R. **Tracheid length variation in Loblolly Pine.** *Tech. Rep. Tex. For. Serv.* No. 10, 1957. pp. 22. 7 refs.

Increment cores from a height of 4½ ft. on the N. side of 12 sample trees selected from an even-aged stand on a uniform site were used. Tabulated results show considerable initial difference in tracheid length between trees and a much more rapid increase in tracheid length in the early than in the later periods of tree growth. Trees do not necessarily retain their initial tracheid-length rank throughout successive growth periods. There was no cessation of tracheid length increase up to the ring age (65–69) of the material sampled. Within a growth ring, tracheid length increased from early- to late-wood samples. No correlation was found between initial and ultimate tracheid length, but correlations were found of tracheid length in the 5th (X_5) and 10th (X_{10}) growth rings and later growth rings: for X_5, highly significant relations with the 10th–20th, and significant relations with the 25th and 30th rings, and for X_{10} highly significant relations with 15th–50th rings. The consistent high order of correlation for X_{10} and the lack of any discernible controlling factor lend support to the assumption that there may be genetic control over tracheid length. No evidence was found of a relation between rapid or slow growth and tracheid length, nor of any sudden change in tracheid length between successive growth rings of widely varying width. No correlation was found between sp. gr. and tracheid length.

5098. **Fibre length of Cottonwood.** *Rep. Cent. St. For. Exp. Sta. 1958*, 1959 (39).

Mean fibre length was found to increase, the faster the height and diam. growth and the older the tree [cf. *F.A.* 18 No. 4526]. These influences accounted for 60% of the variability in fibre length among the 83 trees studied, the remaining 40% probably being hereditary.

5099. LIESE, W., and AMMER, U. **Investigation of wood fibre length in Poplar.** *Transl. Commonw. sci. industr. Res. Organ. Aust.* No. 4205, 1958. pp. 12 + 1 dgm., 1 gph. Transl. by W. Knie and E. Bolza from *Holzforschung, Berlin* 11 (5/6), 1958 (169–74). [See *F.A.* 19 No. 4745.] Limited distribution.

5100. MICEK, W. Anatomiczna budowa rdzenia u modrzewia europejskiego (*Larix europaea* DC.), polskiego (*L. polonica* Rac.) i syberyjskiego (*L. sibirica* Lebd.). **[Anatomical structure of the pith of *L. decidua, L. polonica* and *L. sibirica.*]** *Acta Soc. Bot. Polon.* 27 (4), 1958 (613–29 + 1 tbl.). 7 refs. [Pol.e.] O.B.D.

No distinct differences could be found in the pith cells of the 3 species, and their identification on this basis does not seem to be possible.

811.2. Special Features and Abnormal Structure

See also Nos. 5306–8.

5101. PURKAYASTHA, S. K. **An anatomical study of the effects of scarification in *Sterculia urens* Roxb. trees.** *Indian For.* 85 (2), 1959 (126–30 + 1 plate). 16 refs.

In order to study the development of gum canals in the secondary tissues, blocks consisting of bark, cambium and wood were cut out at different seasons of the year from both tapped and untapped trees. Gum canals normally occur only in the pith and cortex, but are produced lysigenously in the secondary xylem or phloem as a result of wounding, being formed by the disintegration of the parenchyma cells near the cambium. Wood formed in the vicinity of the wound after tapping becomes spongy, weak, and coarse-textured. Most of the tissues formed after wounding are parenchymatous in nature with relatively thin walls; these parenchyma cells also differ from normal cells, being larger and radially flattened. The fibres are usually very poorly developed, the vessels are smaller and more numerous, but the rays are not much affected. These changes have been observed to extend on all 4 sides of the tapping face, but more in the vertical than the lateral directions, with maximum development of abnormal wood and gum canals above the wound. The phloem is not much affected by wounding, and no gum canals are usually formed, though severe tapping sometimes results in the rays disintegrating into a gummy substance.

811.4. Growth Rings. Early and Late Wood

See Nos. 5014, 5168–9.

811.6. Texture, Grain, Figure

5102. CHATTAWAY, M. M. **Spiral grain in *Pinus radiata*.** *For. Prod. Newslett. C.S.I.R.O. Aust.* No. 250, 1959 (3–4). 2 refs.

[Cf. *F.A.* 19 No. 3396.] An examination of two internodal disks throughout the length of the tree, each split radially on N.–S. or E.–W. bearings, in 8 trees, 13–30 years old, indicates moderate twist in young trees in wood laid down in the crown, with a maximum in the third to fourth rings (left-hand spiral). This tends to straighten out with age.

811.7. Phloem; Bark

See also Nos. 4142, 4194, 5306.

5103. HALL, A. D. **The structure and variability of mature wood bark.** *Annual Ring* 1959 (21–5). 4 refs.

Describes and discusses the significance of anatomical variations in bark with special reference to the tree species of Ontario. Subjects include structural variations between species, adjustment of tissues with stem expansion, and the relationship of gross bark features to anatomical structure.

812. Physical and Mechanical Properties

See also No. 5287.

5104. MOŽINA, I. Komparativna raziskovanja lesa domačih drevesnih vrst. Bukev (*Fagus silvatica* L.). [**Comparative studies of home-grown timbers. Beech.**] *Zborn. Kmet. Gozd. Fak. Agron. Ljubljana* No. 5, 1958. pp. 69. 93 refs. [Sloven.e.]

Presents data on the sp. gr., strength properties, swelling and shrinkage of wood samples of 55 Beech trees from 11 different sites in Slovenia. Deviations from the mean are discussed, and the mean values compared with the European mean. The relationships of sp. gr. and strength to age or ring width are examined. Statistical analysis showed that differences between wood of 5 trees from each site were not statistically significant, and tests of > 5 trees are therefore necessary for accurate information on the wood properties of a given stand.

5105. HARRIS, J. M., and HELLAWELL, C. R. **The physical and mechanical properties of Rewarewa (*Knightia excelsa* R. Br.).** *Tech. Pap. For. Res. Inst. N.Z. For. Serv.* No. 25, 1958. pp. 24 + 6 photos. 9 refs.

An analysis based on 20 stems. A high ratio of radial to tangential shrinkage (up to 3/1) causing seasoning difficulties and frequent defects of form etc., limit its uses despite good strength properties and small variation in density.

5106. Importância dos estudos de laboratório no desenvolvimento da indústria da madeira. [**Importance of laboratory studies in the development of the wood industry.**] *An. bras. Econ. flor., Inst. nac. Pinho* 10, 1958 (167–71). [Port.]

Includes data obtained in the Instituto Nacional de Tecnologia on the physical and mechanical properties of *Eucalyptus citriodora*, with particular reference to differences between values for heartwood and sapwood, and variations in the heartwood in the radial direction.

812.1. Optical, Acoustic, Frictional, Thermal and Electrical Properties

See also Nos. 5196, 5201, 5257.

5107. NARAYANAMURTI, D., and SANJIVA, U. **Reflection and transmission of infrared rays by Indian timbers.** *Repr.* from *Bull. Res. Coun. Israel* 6*C* (2), 1958 (109–12). 7 refs.

[Cf. *F.A.* 16 No. 2265.] Tabulates the % reflection for (*a*) 44 species (air-dry), and (*b*) 5 species (wet and dry); and (*c*) the maximum penetrability (mm.). The % reflection of (*a*) and (*b*) decreased with increases in density and wetness respectively. Conifers exceeded hardwoods in (*c*). Extreme values for (*a*) were 21·7 (*Diospyros* sp.) and 41·2 (*Cryptomeria*); for (*b*) 8·17 wet and 39·2 dry (*Cryptomeria*); for (*c*) 2 (*Calophyllum* sp. and *Terminalia bialata*) and 7·6 (*Cryptomeria* and Balsa).

5108. STOŠIĆ, D. Ž. Untersuchungen über den statischen Reibungskoeffizienten des Holzes. [**Investigations on the static coefficient of friction of wood.**] *Holz Roh- u. Werkstoff* 17 (3), 1959 (86–7). [G.g.e.] P.R.

Investigates the influence on the magnitude of the [wood/wood] friction coefficient μ of: (1) species—Oak, Beech, Ash, Elm, Spruce; (2) surface smoothness—planed, smoothly sawn, frame-sawn; (3) fibre direction—radial or end-grain surface/radial surface; (4) specific pressure—1, 100, 500 and 1000 g./sq.cm. For (1), Ash on Ash, Beech and Elm gave the lowest, and Spruce on Spruce, Elm and Beech the highest μ. In general μ increased with increasing surface roughness, and was greater with radial/radial than with end-grain/radial surfaces, though there were exceptions to both trends; μ was highest at the lowest specific pressure, falling sharply to a minimum at 250 g./sq. cm. and then rising slowly to 1000 g./sq.cm. The experiments continue.

5109. ČUDINOV, B. S. Rasčet processov ottaivanija merzloj drevesiny. [**Calculating the thawing out processes in frozen wood.**] *Derev. Prom.* 7 (12), 1958 (10–1). 4 refs. [Russ.] P.R.

Nomograms based on equations derived from existing data are presented for calculating the rate of change of the temperature field on heating frozen logs and sawn timbers (irrespective of species). On this basis the mean effective temperature conductivity was found for Birch bolts of 30 cm. diam. and 70% m.c. thawed from an initial −20° C. to +20° in water at 80° [cf. *F.A.* 20 No. 961].

5110. TEESDALE, L. V. **Thermal insulation made of wood-base materials. Its application and use in houses.** *Rep. U.S. For. Prod. Lab., Madison* No. 1740 (rev.) 1958. pp. 41 + 8 photos, 8 drawings, 3 gphs., 9 tbls., 2 maps. 35 refs. P.R. [Cf. *F.A.* 11 No. 2750.]

5111. OGARKOVA, T. V. **Effect of the degree of compression on the coefficient of linear expansion of Birch wood.** *Trans. Commonw. sci. industr. Res. Organ. Aust.* No. 4066, 1958. pp. 4. 2 refs. Transl. by E. Feigl from *Derev. Prom.* 6 (9), 1957 (17–8). [See *F.A.* 20 No. 962.] Limited distribution.

812.2. Behaviour with Liquids and Gases. Moisture Relations etc.

See also Nos. 5220, 5244–5, 5287–8, 5295, 5300.

5112. KENAGA, D. L., and COWLING, E. B. **Effect of gamma radiation on Ponderosa Pine: hygroscopicity, swelling, and decay susceptibility.** *For. Prod. J.* 9 (3), 1959 (112–6). 15 refs.

Describes experiments using a Co^{60} source at dosages up to 10^7 r.e.p. and rates up to 0·6 mega r.e.p./hr., on Ponderosa sapwood (oven-dry, air-dry or saturated). Changes induced, though often statistically significant, were generally too small to have practical importance.

5113. SPALT, H. A. **The fundamentals of water vapour sorption by wood.** *For. Prod. J.* 8 (10), 1958 (288–95). 10 refs.

Presents data on adsorption and desorption of N. American and tropical species (8 hardwoods and

8 softwoods) and also of acetylated *Picea glauca*, so as to evaluate the effect of de-activation of surface hydroxyls, particularly on hysteresis. Results were in basic agreement with equations based on the solid-solution sorption model for polymers developed by Hailwood and Horrobin, and in conformity with earlier findings and theories developed for wood [cf. Barkas, *F.A.* 5 p. 36; 11 No. 1864]. Hysteresis was less in woods rich in extractives than in those poor in them, a fact attributed to the bulk of amorphous void volume. Some hysteresis persisted in the acetylated *P. glauca*. [Cf. *F.A.* 19 No. 2282.]

5114. CHRISTENSEN, G. N., and KELSEY, K. E. **The sorption of water vapour by the constituents of wood: Determination of sorption isotherms.** *Repr.* from *Aust. J. appl. Sci.* 9 (3), 1958 (265–82). 24 refs.

The sorption isotherms of water vapour were determined at 25° C. on a sample of *Eucalyptus regnans*, on its holocellulose, hemicellulose, and cellulose fractions, and on Klason and methanol lignins prepared from it. The results obtained enabled approximate estimates to be made of the relative contributions to the total sorption by the wood of its 3 major constituents, viz. wood cellulose $\leqslant 0{\cdot}47$, hemicelluloses $\geqslant 0{\cdot}37$, and lignin $\geqslant 0{\cdot}16$. Isotherm shapes were generally similar for all fractions tested but the magnitude of the sorption hysteresis differed considerably, being greater for the lignins than for the carbohydrate fractions. Sorption by the methanol lignin seemed anomalous in being only half that of the less reactive Klason lignin. This was considered to have been caused by physical changes during the methanol extraction and precipitation. [Cf. *F.A.* 18 Nos. 4545–6.] *From authors' summary.*

5115. ITO, S. **[On the water suction mechanism of wood. VI. Pressure of gas locked in wood by water.]** *J. Jap. Wood Res. Soc.* 4 (6), 1958 (219–22). 5 refs. [Jap.e.*e.*] P.R.

Presents graphs indicating the changes in the states of gases locked in the wood, for internal pressure, expelled gas and remaining gas volume, and describes the apparatus used.

5116. HOWELL, R. S., and KEMP, D. **Comparison of methods of sampling for the measurement of moisture content in green timber.** *Rep. For. Res. For. Comm., Lond. 1957/58*, 1959 (156–60).

Four methods were tested on 2 trees: (*A*) standard 4-in.-thick disks sawn from the log, (*B*) complete ½-in. disks, (*C*) pairs of opposite sectors cut from 1-in. disks, the width of each sector at the circumference being 1–1·5 in., (*D*) pairs of cores, extending almost to the pith, taken with a standard Pressler borer from a diameter at right angles to that selected for (*C*) and at a height 3 in. above or below it. The analysis was directed to the comparison of the methods in terms of their bias and the variance of their random error. Compared with (*A*), (*D*) gave results averaging 24% too low. (*B*) and (*C*) also gave underestimates, but the bias of (*C*) differed less between trees than that of (*B*).

5117. KUMAR, V. B. **Studies on moisture determination of veneers by resistance moisture meters.** *Pap. ja Puu* 41 (4*a*), 1959 (167–70). 16 refs. [E.e.fi.] P.R.

In studies on meters with different types of electrode (contact, gripping or piercing), results for freshly dried Beech veneers were very variable, the piercing type of electrode giving the most reliable results. When veneers were stacked for some days before testing, reliability improved and there was less variation with electrode type.

5118. BENIĆ, R. Istraživanja o rasporedu nekih fizičkih svojstava drveta u deblu poljskog i običnog jasena. **[The distribution of some physical properties of wood in the stem of *Fraxinus angustifolia* and *F. excelsior*.]** *Glasn. šumske Pokuse* No. 13, 1957 (509–36 + 1 tbl.). 11 refs. [Croat.e.*e.*]

Presents results of studies on variations, either from the pith outwards or longitudinally, in sp. gr., nominal sp.gr., volumetric shrinkage and fibre-saturation point, showing correlation coefficients where they exist.

5119. KRPAN, J. Istraživanje točke zasićenosti vlakanaca važnijih domaćih vrsta drveta. **[Experiments on the fibre-saturation point of the more important Jugoslavian species.]** *Glasn. šumske Pokuse* No. 13, 1957 (18–109). 67 refs. [Croat.e.*e.*]

Describes selection of material and procedure in determining fibre-saturation point from volumetric shrinkage and from crushing strength ||, and discusses the results for *Quercus robur*, *Fagus sylvatica*, *Abies alba* and *Picea abies*, including the effect on results of some variables, e.g. method, size of sample and, for Oak, part of tree (root, stem branch), heart or sapwood, and position in stem.

5120. BOSSHARD, H. H. **On the anisotropy of wood shrinkage.** *Transl. Commonw. sci. industr. Res. Organ. Aust.* No. 3945, 1958. pp. 23 + 9 plates. 31 refs. Transl. by B. A. Fischer from *Holz Roh- u. Werkstoff* 14 (8), 1956 (285–95). [See *F.A.* 19 No. 2284.] Limited distribution. P.R.

5121. KHANMAMEDOV [HANMAMEDOV], K. M. **The causes of differences in radial and tangential shrinkage of wood.** *Transl. Commonw. sci. industr. Res. Organ. Aust.* No. 3623, 1957. pp. 6 + 3 dgms., 1 gph. 14 refs. Limited distribution. Transl. by M. Slade from *Izvestija Akademii Nauk Azerbaidžanskoj SSR* 8, 1954 (89–94).

Samples of *Fagus orientalis*, *Fraxinus excelsior* and *Pinus sylvestris* were soaked in salt solutions and allowed to dry out. The difference in residual swelling between the tangential and radial sections suggests that there are more intermicellar spaces in which the salt crystals remain after drying, in the tangential than in the radial direction. These results and a survey of literature suggest that the difference in radial and tangential shrinkage is caused by a number of factors, of which the difference in intermicellar space per unit length, the strong lateral shrinkage of the medullary rays, and the greater tangential shrinkage of the late wood are the chief.

5122. WIJESINGHE, L. C. A. DE S. **The shrinkage of rays and fibres in wood.** *Forestry* 32 (1), 1959 (31–8 + 1 plate). 12 refs.

Shrinkage was measured on wood sections of

Artocarpus integra, *Canarium zeylanicum* and *Acer pseudoplatanus*. Shrinkage stresses between rays and fibres were demonstrated by drying radial strips of tissue containing rays on one side and fibres on the other. Strains developed by these stresses were removed by dissection of the rays from the fibres, which decreased the radial shrinkage of the rays and increased that of the fibres. The difference between the radial and tangential shrinkage of the fibres was reduced but not removed, by separation from the rays, and this inherent anisotropic shrinkage of the fibres must constitute an important cause of the differential shrinkage of wood. *From author's summary.*

5123. NAKATO, K. **[On the cause of the anisotropic shrinkage and swelling in wood. X. On the relationships between the microscopic structure and the anisotropic shrinkage in transverse section. (3).]** *J. Jap. Wood Res. Soc.* 4 (5), 1958 (183–6). 9 refs. [Jap.*e.e.*] P.R.

[Cf. *F.A.* 20 No. 2289.] Tabulates the results of investigations on *Cryptomeria japonica*, *Abies firma* and *Larix leptolepis*, and presents equations assessing radial and tangential shrinkage in summerwood and springwood.

5124. NAKATO, K. **[On the cause of the anisotropic shrinkage and swelling of wood. XI. On the relationships between the microscopic structure and the anisotropic shrinkage in transverse section (4).]** *J. Jap. Wood Res. Soc.* 4 (5), 1958 (187–91). 13 refs. [Jap.*e.e.*] P.R.

Investigations were made on specimens of *Abies firma*, *Larix leptolepis*, *Quercus crispula*, *Cardwellia sublimis*, *Helicia terminalis*, *Piper elongatum* and *Q. ilex*. Tables show the anisotropic shrinkage of the various fine- and broad-rayed species, shrinkage of the wood parenchyma being determined in the case of *Q. crispula* from photomicrographs indicating the fine cross-section of the wood. Radial and tangential shrinkage of wood parenchyma were respectively 7·7 ± 1·1 and 7·8 ± 1·3%.

5125. NAKATO, K. **[On the cause of the anisotropic shrinkage and swelling of wood. XII. On the relationships between the microscopic structure and the anisotropic shrinkage in transverse section. (5).]** *J. Jap. Wood Res. Soc.* 4 (6), 1958 (205–10). 11 refs. [Jap.*e.e.*] P.R.

Investigates the effects of fine and broad rays on the radial shrinkage of early and late wood of *Cryptomeria japonica*, *Abies firma*, *Larix leptolepis* and *Quercus crispula*. Comparative results are tabulated.

5126. YOUNGS, R. L., and NORRIS, C. B. **A method of calculating internal stresses in drying wood.** *Rep. U.S. For. Prod. Lab., Madison* No. 2133, 1958. pp. 18 + 1 dgm., 5 gphs. 4 refs. P.R.

The drying stresses (⊥ to grain and shear) in a 2 × 7-in. flat-sawn plank of Northern Red Oak (*Quercus rubra*) were calculated, using a technique of strain analysis [cf. *F.A.* 16 No. 4721] in which a section is cut 1 in. along the drying board and sliced into several (usually 10) slices ‖ to the faces, the change in length of each slice being measured as it is cut free. The method evolved makes use of data on strain recovery and on the ⊥-to-grain elastic properties of matched wood specimens, for, since the instantaneous recovery of the slices is an elastic phenomenon, knowledge of elastic properties under comparable conditions of temperature, moisture content and growth-ring orientation can be used to interpret strain data in terms of stress [cf. *F.A.* 19 No. 2291]. Although the complex mathematics involved in the present procedure presents difficulties, work with such an analytical technique is likely to be increasingly facilitated by use of an electronic computer.

4127. SKAAR, C. **Moisture movement in Beech below the fibre-saturation point.** *For. Prod. J.* 8 (12), 1958 (352–7). 24 refs.

The fact that, in drying experiments with *Fagus grandifolia* heartwood in the ranges of 8 to 28% m.c. and 10 to 60° C., the moisture diffusion coefficient [cf. *F.A.* 16 No. 3368] was more sensitive to temperature in the radial than in the tangential direction, and that only in the radial direction was it affected by m.c., is attributed to the greater importance of vapour movement (as distinct from movements of bound water) in the radial direction, presumably due to the rays.

5128. STAMM, A. J. **Bound-water diffusion into wood in the fiber direction.** *For. Prod. J.* 9 (1), 1959 (27–32). 21 refs.

Describes experiments with small samples of heart- or sapwood of various species, 0·1–0·2 in. thick in the fibre direction, whose voids had been filled as completely as possible (65–90%) with an alloy of Bi, Sn and Pb that melts at 105° C. and expands slightly on solidifying, so as to eliminate both liquid flow and vapour diffusion. Bound-water diffusion of air-dry samples, thus isolated, was measured under water at 25·5°. Additional tests at temperatures from 3·5 to 56·5°, and on exposure to atmospheric humidity at 5 levels was made with Sitka Spruce. Bound-water diffusion coefficients at 0·6 saturation were about the same whether based on weight increase or swelling and, for all softwoods except Redwood, were of the order of $39 \pm 5 \times 10^{-8}$ sq. cm./sec., independent of specimen thickness and density. They were slightly higher for hardwoods, and nearly double for Redwood on account of the bulking action of the water-soluble extractives in the cell-wall. There was little difference between heart- and sapwood. The diffusion coefficient increased with increased temperatures in the same manner as the increase in vapour pressure of water, the logarithm of the coefficient varying as the reciprocal of the absolute temperature. These facts are interpreted as supporting the theory that the inward diffusion results from the jump of single molecules from one adsorption site to another of greater attractive force, and that water is held by H bonding. The diffusion coefficient increased in an exponential manner with an increase in the mean moisture content of the wood. The continuous diffusion coefficient experimentally established for bound water in the fibre direction was about half the earlier estimated value. [Cf. *F.A.* 9 No. 301.]

812.3. Density. Specific Gravity. Buoyancy

See also Nos. 5013, 5118, 5168–70.

5129. Stojanoff [Stojanov], V., and Entcheff [Enčev], E.; Göhre, K., and Götze, H. Über die Verteilung der Rohwichte im Stamm und ihre Beeinflussung durch Wuchsgebiet und Standort. **[Wood density variation within the stem and the influence on it of growth region and site.]** *Arch. Forstw.* 7 (12), 1958 (953–8; 959–74). 7 + 8 refs. [G.g.russ.e.]

The first authors [cf. *F.A.* 13 No. 1498] take up statements of K. Göhre and H. Götze on wood density variation in Beech [see *F.A.* 19 No. 935] and of Göhre on that of Douglas Fir, Pine, Beech and 2 Poplars [see *F.A.* 20 No. 2354] to refute them in detail, using Bulgarian data on Oak, Elm and Beech. Göhre and Götze in reply quote from data published by Stojanov and Enčev to show that their arguments, based not on the range of values but on their means, are statistically unwarrantable.

812.7. Strength Properties

See also Nos. 5119, 5168, 5205, 5219–21, 5308.

5130. Takashima, T., Kawaguchi, M. and Miyake, Y. **[On the strength of Kiri [*Paulownia tomentosa*] wood. I & II.]** *J. Jap. Wood Res. Soc.* 5 (1), 1959 (18–27). 18 refs. [Jap.e.*e.*] P.R.

(I) Compares the bending and tensile strength of Chinese- and Japanese-grown specimens. Within a restricted range, strength and Young's modulus of bending were not affected by differences of m.c. and sp. gr. (II) Presents graphs and tabulates the results of tests made to determine the compression and shear strengths of Chinese- and Japanese-grown specimens. No significant strength differences were observed, nor any special relationship between annual ring width and sp. gr. (oven-dry).

5131. Knežević, M. Uticaj ugla presecanja vlakanaca na čvrstoću pritiska i savijanja kod bukovine. **[The influence of sloping grain on the compression strength and bending strength of Beech.]** *Šumarstvo* 11 (7/8), 1958 (389–99). 1 ref. [Serb.e.f.]

Using the method previously described [see *F.A.* 19 No. 940], the reduction in strength from sloping grain at deviations from parallel of 0, 5, 10, 15 and 20% is shown in graphs. Though the maximum deviation tested in the earlier work on Oak was only 7%, results show that the decrease in strength from sloping grain is less in Beech than in Oak.

5132. Iseda, S., and Tsuji, Y. **[Physical properties of plywood under low temperature (from −55° C. to −65° C.).]** *Wood Ind., Tokyo* 14 (2), 1959 (23–6). 4 refs. [Jap.e.*e.*] P.R.

Specimens of Hard Maple, Black Ash and White Pine plywood were frozen in dry ice in a Dewar flask for 60 hours, random tests being made on them at different stages of freezing. Compared with the plywood properties observed under normal conditions, the shearing, bending and nail-holding values obtained under freezing conditions were 10–20% higher, but impact strength was lower.

5133. Tottenham, H. **The sustained load strength of timber.** *J. Inst. Wood Sci.* No. 2, 1958 (31–9). 8 refs.

Critically examines timber as a viscous-elastic material and investigates various possible criteria for the onset of plastic flow. Of the simple criteria of breakdown of a viscous-elastic medium, that of a critical maximum strain (the Coulomb hypothesis) is, in the author's opinion, the only one applicable to timber on the basis of present experimental evidence, and the establishment of such a criterion can lead to a rapid method of determining the sustained load strength of timber. [Cf. *F.A.* 7 No. 1213.]

5134. Sugiyama, H. **[The effect of sustained loading on the compressive strength properties of wood under short-time loading.]** *Repr.* from *Transactions of the Architectural Institute of Japan* No. 58, 1958 (21–7). 4 refs. [Jap.e.*e.*] P.R.

Presents test results on the effect of four magnitudes of sustained loading (105 days), at loads well below the creep limit in compression (< 50% of ultimate strength), on the strength properties in compression || of *Cryptomeria japonica* from the Akita district. The specimens, 3 × 3 × 6 cm. with the grain || to their length, were so cut that end-matched pairs were obtained. Comparisons of the compressive strength and moduli of elasticity for 'creep-test specimens', i.e. specimens subjected to a sustained load of < 50% of the ultimate strength in compression, with those for unstressed specimens, suggest that such sustained loading has no effect on the compressive strength and modulus of elasticity as tested by subsequent loading to failure. The proportional limit for creep-test specimens was higher than that for unstressed specimens, while the strain corresponding to the maximum compressive strength was smaller. The magnitude of sustained stress (44·5, 89, 133·5 and 178 kg./sq. cm.) had no effect on their compressive strength and modulus of elasticity but the greater the magnitude, the higher was the subsequent proportional limit, e.g. for specimens subjected to a sustained stress of ⅓ of their ultimate strength the limit was 125% of that for previously unstressed specimens. Results, which were duly weighted for differences in moisture conditions, are presented in tables and graphs.

5135. Kitahara, K., and Okabe, N. **[The influence of temperature on creep of wood by bending test.]** *J. Jap. Wood Res. Soc.* 5 (1), 1959 (12–8). 6 refs. [Jap.e.*e.*] P.R.

Presents graphs showing the time/creep relationships in *Chamaecyparis obtusa* at constant temperatures. Tables indicating, in English, the values obtained at different loads and at different intervals are included.

5136. Clouser, W. S. **Creep of small wood beams under constant bending load.** *Abstr. of thesis*, in *Dissert. Abstr.* 19 (7), 1959 (1698). O.R.S.

The creep of small Douglas Fir beams under concentrated loads is analysed, and results are presented in terms of stress level, power law equation constants, creep rate and time.

5137. Robinson, H., and Cooper, D. W. **The ultimate strength in bending of structural grade European Redwood.** *J. Inst. Wood Sci.* No. 2, 1958 (40–65). 7 refs.

Gives results of flexural tests made on 44 beams of different breadth/depth ratios, the initial purpose of the investigation being to obtain a relationship for the variation of modulus of rupture (m.r.) with beam depth. The m.r. for each beam was calculated, but large variations in the results prevented any direct m.r./beam-depth relationship being established without correcting for all other variables and defects. Most beams showed a combination of compression, tension and shear failures at collapse; a close approximation to the moment of resistance of the beam at failure was obtained by constructing a stress diagram representing pictorially the mean position of the failures, and by utilizing the crushing strength of the timber, as derived from the small samples cut from the beam. The stress diagram is directly dependent upon variations in the quality of timber across the section of beam and upon the extent and location of such defects as knots and end splits, which appear to influence failure position and hence the ultimate strength. Detailed test results and examples illustrating the construction of the stress diagram and the calculation of the ultimate moments of resistance are presented. *From authors' summary.*

5138. Schniewind, A. P. **An improved and semi-automatic method of conducting the standard hardness test for timber.** *Bull. Amer. Soc. Test. Mater.* No. 236, 1959 (57–9). P.R.

The method described is used for recording the load at the specified penetration with any testing machine having an automatic load-deformation recorder and equipped with a specially modified hardness tool, the movable collar of which rises on contact with the wood specimen, thus displacing the differential transformer and causing a signal to be received by the recorder. In one series of tests on specimens of *Abies magnifica*, the (1) semi-automatic and (2) hand-operated methods were compared and variance analyses made of the results obtained, which for (2) were significantly influenced by the human element involved. In another series, where no such operator effect obtained, no significant difference was found between the results obtained by the two methods, and method (1) was declared to conform exactly to the specifications of the test.

5139. Vliet, A. C. van. **Strength of second-growth Douglas Fir in tension parallel to the grain.** *For. Prod. J.* 9 (4), 1959 (143–8). 19 refs.

In tests with 529 samples from 5 Oregon regions, tensile strength was similar to old growth, both green and at 12% m.c. Strength increased with sp. gr. and number of rings per inch. The latter had a considerable effect on strength but, in the dry state, no effect on sp. gr.

5140. Mamada, S. **[Studies of the impact withdrawal resistance of nail in wood. II.]** *J. Jap. Wood Res. Soc.* 5 (1), 1959 (27–31). 4 refs. [Jap.e.*e*.] P.R.

[Cf. *F.A.* 19 No. 4790.] Continues, in greater detail, a study of the impact withdrawal resistance (i.w.r.) of nails [types described] driven into specimens of *Cryptomeria japonica, Chamaecyparis obtusa, Abies firma, Cercidiphyllum japonicum, Tilia japonica, Fagus crenata, Quercus crispula, Fraxinus commemoralis, Populus tremula* and *Shorea* spp. [properties tabulated in English]. Values for absorbed energy are presented in graphs from readings of an impact-testing machine, and empirical formulae are given indicating the relationships of i.w.r. to nail diameter, depth driven, mean annual ring width and sp. gr. of wood.

812.8. Workability. Working Properties

5141. **[Working qualities of *Antrocaryon micraster* and *Cedrela mexicana*.]** *Rep. For. Dep. Ghana 1955/56*, 1958 (53).

Timber of *A. micraster* (indigenous, widely distributed, but never very common) and locally grown West Indian Cedar (*Cedrela mexicana*) were sawn and tested for rotary peeling, hand and machine working, nailing, sanding and painting, and proved satisfactory. It is suggested that *C. mexicana* might be more extensively planted.

813. Wood Chemistry

See also Nos. 4125, 5320, 5383.

5142. Seabra, L. de, and Ramos, M. Nogueira. Acerca de preparação de serradura para análise química. Estudo analítico de homogeneidade das amostras. **[The preparation of sawdust for chemical analysis. An analytical study of the homogeneity of samples.]** *Garcia de Orta, Lisboa* 6 (3), 1958 (477–506). 17 refs. [Port.f.e.]

Comparisons were made of sawdust samples prepared by (1) a band saw, (2) a rasp and (3) a Wiley mill. It was concluded that sawdust obtained through (3), and particularly the 40–60 mesh fraction, presented the greatest homogeneity. In experiments with various mesh fractions of sawdust obtained from a Wiley mill using wood of *Eucalyptus citriodora*, it was concluded that in practice the 80–100 mesh fraction was to be preferred to the 40–60 mesh, since the particles were not so fine as to clog the crucible, or so coarse as to give incomplete action of reagent.

5143. Grohn, H., and Schierbaum, F. **Enzymatic degradation tests on vibratory ball milled wood and cellulose.** *Transl. Commonw. sci. industr. Res. Organ. Aust* No. 4221, 1958. pp. 18 + 3 gphs., 2 dgms. 24 refs. Transl. by W. Knie from *Holzforschung, Berlin* 12 (3), 1958 (65–73). [See *F.A.* 20 No. 1003.] Limited distribution.

813.1. Chief Organic Constituents. Constituents of the Cell Wall

See also Nos. 4131, 5114.

5144. Kozmál, F., and Rendoš, F. **Primary cell wall in wood.** *Papir a Celulosa* 13, 1958 (217–22). [Cz.?] From *abstr.* in *Chem. Abstr.* 53 (7), 1959 (6607). P.R.

Examines the changes in the primary cell-wall when subjected to the action of chemicals such as H_2SO_4, H_3PO_4 and $ZnCl_2$ under different conditions. To a great extent the behaviour of the fibre surface depends on the quality and type of the wood pulp. The primary wall and outer layer of the secondary wall are considerably more resistant to alkalis than to acids, and the surface of kraft pulp fibre remains practically unchanged after pulping, thus showing lower reactivity. No difference was observed between primary cell-walls of spring and autumn woods.

5145. WARDROP, A. B., and DADSWELL, H. E. **Changes in wood and fibre structure observed in the preparation of cold soda pulps.** *J. Inst. Wood Sci.* No. 2, 1958 (8–21). 20 refs.

Studies the structural changes occurring in the wood and wood fibres of *Eucalyptus regnans* and *Pinus radiata* during the preparation of cold soda pulps. The lignin was shown to be concentrated in the outer layer of the secondary wall, agreeing with published results on European species. When wood chips are soaked in dilute alkali there is some swelling of the cell-wall, which is restrained by the highly lignified regions of the outer part of the fibre. On passing the alkali-soaked wood through the Bauer refiner fitted with breaker plates and subsequently with rubbing plates, the region of the cell-wall external to, and including the outer layer of the secondary wall is broken away, exposing the lightly lignified middle layer of the secondary wall as the bonding surface between the fibres. The lower lignification relative to the intercellular layer in hardwoods as compared with softwoods is considered a possible factor making the former more suitable for the preparation of cold soda pulps. Electron microscopy of the pulps reveals the fairly irregular outline of the microfibrils, possibly due to adhering non-cellulosic polysaccharides and lignin. The use of electron stains supports the conclusion that direct cellulose-cellulose bonds are rare in cold soda pulps. *From authors' summary.*

5146. BAYLIS, P. E. T., and PEPPER, J. M. **The isolation of lignin from Aspen wood.** *Abstr.* in *Chemistry in Canada, Ottawa* 10 (4), 1958 (62). L.S.

A new type of lignin was isolated, by acidolysis of pre-extracted wood flour, and some of its chemical properties were studied. The Aspen lignin and that isolated previously from Spruce by a similar technique were compared.

5147. MUGG, J. B. **The methanol-extractable materials in newly formed Aspenwood [*Populus tremuloides*].** *Tappi* 52 (4), 1959 (289–94). 25 refs. P.R.

[Cf. *F.A.* 18 No. 3324.] The lignifying tissues of Aspen were extracted with methanol, and the extractives examined after being fractionated, on the assumption that the compounds participating in the formation of lignin could be detected in the tissues undergoing lignification. Phenylalanine, tyrosine, and sinapaldehyde were present in the new xylem but shikimic acid, ferulic acid, sinapic acid, or coniferaldehyde, although among the compounds postulated in the sequence leading to coniferyl and sinapyl alcohols, i.e. the compounds considered as the 'primary building stones' or 'monomeric units' of lignin, were absent. Amino-acid analyses indicated that the amounts of amino acids in mature wood were small, relative to the amounts in new xylem, but analyses for sinapaldehyde indicated appreciable contents for both tissues. Braun's lignin isolated from partly lignified wood closely resembled that prepared from the mature wood with respect to infra-red and ultra-violet spectra, methoxyl content, and physical appearance. When the infra-red spectrum of Braun's Aspen lignin was compared with that of Braun's lignin from 6 other hardwoods and softwoods, similarities and differences that did not correlate with botanical classification were observed between the spectra. *From author's summary.*

5148. PEPPER, J. M., and ADLER, E. **Acidolysis of Spruce wood and isolated lignins.** *Abstr.* in *Chemistry in Canada, Ottawa* 9 (4), 1957 (63). L.S.

5149. HAMILTON, J. K., and QUIMBY, G. R. **The extractive powers of lithium, sodium and potassium hydroxide solutions for the hemicelluloses associated with wood cellulose and holocellulose from Western Hemlock.** *Abstr.* in *Chemistry in Canada, Ottawa* 9 (4), 1957 (62). L.S.

NaOH and LiOH were much more effective than KOH for the mannose-containing polysaccharides. All three hydroxides had nearly equal solvent powers for xylose, arabinose, galactose, and polysaccharides containing uronic acid.

5150. HUNT, K., and DUTTON, G. G. S. **Sitka Spruce hemicelluloses.** *Abstr.* in *Chemistry in Canada, Ottawa* 9 (4), 1957 (62). L.S.

The hemicellulose contained *d*-xylose, *l*-arabinose, *d*-glucose, and *d*-galactose, as well as uronic acid components. Further extraction of the solid residue gave a hemicellulose which, on hydrolysis, yielded only *d*-glucose and *d*-mannose.

5151. ADAMS, G. A. **Uronic acids from White Spruce (*Picea glauca* (Moench) Voss).** *Canad. J. Chem.* 37 (1), 1959 (29–34). 32 refs. O.R.S.

Acid hydrolysis of extractive-free wood produced a number of neutral and acidic sugars and oligosaccharides.

5152. MEIER, H. **Studies on the hemicelluloses from Pine (*Pinus silvestris* L.)** *Acta chem. scand.* 12 (10), 1958 (1911–8). 11 refs. [E.e.] O.R.S.

A number of glucomannan fractions and an araboxylan fraction were isolated from Pine holocellulose and studied.

5153. JONES, J. K. N., and PAINTER, T. J. **The hemicelluloses of Loblolly Pine (*Pinus taeda*) wood. Part II. The constitution of hexosan and pentosan components.** *J. chem. Soc.* Feb., 1959 (573–80). 20 refs. O.R.S.

A hemicellulose fraction similar to that already isolated [cf. *F.A.* 18 No. 4579] was divided into two subfractions containing residues of (1) galactose, glucose and mannose and (2) xylose and 4-*o*-methyl-glucuronic acid.

5154. Bouveng, H. O., and Lindberg, B. **Studies on arabogalactans. II. Fractionation of the arabogalactan from *Larix occidentalis* Nutt. A methylation study of one of the components.** *Acta chem. scand.* 12 (10), 1958 (1977–84). 16 refs. [E.e.] O.R.S. [Cf. *F.A.* 18 No. 4583.]

5155. Gillham, J. K., Perlin, A. S., and Timell, T. E. **The configuration of glycosidic linkages in oligosaccharides. VII. 4-*O*-β-D-galactopyranosyl-D-galactose from [an α-cellulose of] White Birch wood.** *Canad. J. Chem.* 36 (12), 1958 (1741–3). 9 refs. O.R.S. [Cf. *F.A.* 20 No. 2338.]

5156. Corbett, W. M., and Ewart, J. A. D. **Separation of xylan from Beech holocellulose.** *Svensk PappTidn.* 62 (8), 1959 (277–83). 29 refs. [E.e.sw.g.] P.R.

The relation between xylan and holocellulose was studied by (1) fractional precipitation of the holocellulose acetate, (2) alkaline extraction. It was concluded that the major part of the xylan is not chemically bound to cellulose, but there is no evidence to show whether the more alkali-resistant xylan is chemically or physically so bound.

5157. Gillham, J. K., and Timell, T. E. **The hemicellulose of White Elm (*Ulmus americana*). II. The constitution of the methyl glucuronoxylan.** *Canad. J. Chem.* 36 (11), 1958 (1467–74). 44 refs. O.R.S.

813.2. Minor Organic Constituents. Extractives. Cell Contents

See also Nos. 4129, 5147, 5312.

5158. Furusawa, N., and Kondo, T. **[Chemical studies of *Larix kaempferi* Sarg. V. Flavonoid content of pith-damaged wood.]** *J. Jap. Wood Res. Soc.* 5 (1), 1959 (1–4). 13 refs. [Jap.e.*e*.] P.R.

Briefly discusses the mechanism of heartwood phenol formation and compares sound and damaged heartwood of *L. leptolepis*. No distinct correlation was observed for phenol content between the two wood conditions.

5159. Zavarin, E. **Extractive components from Incense Cedar heartwood (*Heyderia decurrens* Torrey). VII. On the occurrence of heyderiol.** *Repr.* from *J. organ. Chem.* 23, 1958 (1264–8). 8 refs.

[Cf. *F.A.* 20 No. 3731.] The new cryptophenolic compound, heyderiol, $C_{22}H_{30}O_4$, was isolated in 0·14% yield (dry wood basis). Its composition and structure are discussed, and it is recognized as another of the group of compounds with *p*-cymene skeleton, interrelated through enzymatic-oxidation, found in heartwood of *Libocedrus decurrens*.

5160. Gardner, J. A. F., Barton, G. M., and MacLean, H. **Occurrence of 2,7-dihydroxy-4-isopropyl-2,4,6-cycloheptatrien-1-one (7-hydroxy-4-isopropyltropolone) in Western Red Cedar (*Thuja plicata* Donn).** *Abstr.* in *Chemistry in Canada, Ottawa* 9 (4), 1957 (62). L.S.

Analytical experiments showed that the heartwood contains $\leqslant$ 0·05%.

5161. Gardner, J. A. F., and Barton, G. M. **Occurrence of β-dolabrin (4-isopropenyl-tropolone), in [steam-volatile oil of heartwood of] Western Red Cedar (*Thuja plicata* Donn).** *Canad. J. Chem.* 36 (12), 1958 (1612–5). 9 refs. O.R.S.

5162. Pratt, R., and Yuzuriha, Y. **Antibacterial activity of the heartwood of *Haematoxylon braziletto*.** *J. Amer. pharm. Ass.* (*sci. Ed.*) 48 (1), 1959 (69–72). 8 refs. O.R.S.

A water-soluble compound from the heartwood killed or inhibited the growth of test bacteria, temporarily inhibited growth of *Trichophyton mentagrophytes*, but had no effect on *Penicillium notatum* or *Monilium fructigena*. The active principle may be brazilein, brazilin or derivatives; it does not occur in unpigmented sapwood or in bark.

5163. **Wood chemistry. [Identification of *Nothofagus* spp.]** *Rep. For. Res. Inst. N.Z. For. Serv. 1957/58*, 1958 (28).

It has been found that minima on the transmittance scale in the ultra-violet band for hot-water extractives of heartwood of *Nothofagus fusca* and *N. menziesii* are significantly different. This fact can be of value in checking the identification of these species, which are difficult to distinguish microscopically.

5164. Comte, P., Ville, A., and Zwingelstein, G. **Intermediate stages in flavonol formation in *Prunus avium*.** *Bulletin de l'Association Française des Chimistes des Industries du Cuir, Paris* 50, 1958 (155–65). [F.?] From *abstr.* in *Chem. Abstr.* 53 (8), 1959 (7322). P.R.

5165. Chopin, J., and Pachéco, H. **Isolation and structure determination of a new flavonocal, extracted from the wild Cherry-tree (*Prunus avium*).** *Bulletin de la Société de la Chimie Biologique, Paris* No. 40, 1958 (1593–601). [F.] From *abstr.* in *Chem. Abstr.* 53 (6), 1959 (5424). P.R.

A new flavonol was isolated from an ether extract of *P. avium* heartwood. It is identified with the methylation product of natural aromadendrine by diazomethane and with the product of hydroxylation in position 3 of sakuranetin by H_2O_2. Its structure is therefore that of 7-methylaromadendrine.

5166. Sandermann, W., and Dietrichs, H.-H. Chemische Studien an Tropenhölzern—3 Mitteilung. Über die Inhaltsstoffe von *Mansonia altissima* und ihre gesundheitsschädigende Wirkung. **[Chemical studies on tropical woods—3. Extractives of *M. altissima* and their injurious effect on health.]** *Holz Roh- u. Werkstoff* 17 (3), 1959 (88–97). 36 refs. [G.g.e.] P.R.

[Cf. *F.A.* 17 No. 1992.] Glycosides known to affect the heart and probably responsible for vertigo, sneezing, nose-bleeding and contact-eczema were found in the sapwood and heartwood of *M. altissima*. Two compounds (*Mansonia*-azulene and *Mansonia*-quinone) were obtained from the wood, one of which has allergenic effects similar to those of chlorophorine (from *Chlorophora excelsa*).

813.3. Ash Constituents

See also No. 5329.

5167. BERGSTRÖM, H. **The ash and phosphorus content of coniferous woods.** *Svensk PappTidn.* 62 (5), 1959 (160–1). 4 refs. [E.] P.R.

Presents tabulated data, including some from work since 1938 by the same author, on % of ash and phosphorus in various parts of Pine and Spruce. The P content was highest in the cambium-plus-bast layer, and higher in bark than in wood, and in sapwood than in heartwood. The total content of alkali metals, Ca, and Mg, was roughly the same (ca. 62% of total ash) in heartwood and sapwood but proportions varied, the alkali metals being concentrated in the sapwood.

813.4. Chemical Effects of Heat. Chemistry of Thermal Decomposition

See Nos. 5360, 5362.

813.8. Poisonous and Irritant Properties

See No. 5166.

814. Natural Durability. Old Wood. Fossilized Wood

See sections 844 and 845.

815. Effect of Growth Factors on Structure and Properties

See also Nos. 4354, 4516, 5092, 5094, 5096–8, 5101–2, 5118, 5129, 5139, 5287, 5305, 5308.

5168. RENDLE, B. J. **Fast-grown coniferous timber—some anatomical considerations.** *Quart. J. For.* 53 (2), 1959 (116–22).

Discusses the anatomical structure of the annual ring and its effects on properties and uses, juvenile and adult wood, etc. [Cf. *F.A.* 19 No. 934; 20 No. 2351.]

5169. SAKATA, K., and SAEKI, H. **[Wood properties of Chizu-Sugi (*Cryptomeria japonica* D. Don grown in Chizu District in Tottori Prefecture). I. On the bulk-density, width of annual rings, and summerwood percentage.]** *J. Jap. Wood Res. Soc.* 4 (6), 1958 (231–6). 6 refs. [Jap.e.*e.*] P.R.

Gives tables and graphs in English showing age, height, volume etc. of the 6 sample trees examined. Data indicating the correlation between the mean annual ring width and density, mean annual ring width and summerwood %, and summerwood % and density are also tabulated.

5170. KENNEDY, R. W., and SMITH, J. H. G. **The effects of some genetic and environmental factors on wood quality in Poplar.** *Pulp Paper Mag. Can.* 60 (2), 1959 (*T*35–*T*36). 9 refs.

Measurements of fibre length (f.l.) and sp. gr. are given for 1-year-old material of *Populus trichocarpa* and *P.* × *regenerata*, fast, medium and slow grown, on good, medium and bad sites. F.l. varied significantly with species and growth rate (average for *P. trichocarpa* 0·497 mm., *P.* × *regenerata* 0·523 mm.), and sp. gr. varied significantly with growth rate, site and interaction of species and site. It is considered that, though it is desirable to have the fastest growing trees with initially high sp. gr. and long f.l., sp. gr. should be favoured over f.l. because of its influence on the weight of pulp produced.

82. Conversion, Shaping, Assembly and Finishing of Wood: General

5171. BERŠADSKIJ, A. A. Rezanie drevesiny. **[The cutting of wood.]** Goslesbumizdat, Moscow & Leningrad. 1958. pp. 328. [Russ.] Price *Roubles* 8.50. I.F.B.

A basic textbook on cutting wood, containing chapters on: general concepts; basic properties of wood to be taken into account in cutting; various methods of cutting, and the work of cutting; normal chip geometry and the basic kinematics; theoretical and experimental investigations on determining specific work in cutting; determining the specific work; sawing; calculation of cutting regimes for work with circular and band saws; calculation of cutting regimes and kinematics of work with frame saws; planing; spindle moulding; sanding.

5172. **[German Industries Fair, Hanover, 1959.]** *Holz-Zbl.* 85 (47), 1959. pp. 192. [G.]

A special number containing a preview of the woodworking machinery section and articles on related subjects, including: Modern pitprop machines (*W. Elsner*) [describing automatic machines for fashioning square plug tenons] and Modern barrel manufacture (*H. Wacker*).

5173. PRUSAK, J. **Hard-chromium plating of woodworking tools.** *Transl. Commonw. sci. industr. Res. Organ. Aust.* No. 4037, 1958. pp. 14 + 4 dgms., 1 gph. 8 refs. Transl. by M. Slade from *Drev. Výskum* 2 (2), 1957 (235–49). [See *F.A.* 20 No. 1033.] Limited distribution. P.R.

5174. **Government Notice No. 85. The Factories Ordinance. Woodworking Machinery Rules.** *Nyasaland Gazette Supplement* No. 15*A*, 1958 (84–6).

Regulations on safety devices and precautions.

5175. FRASER, J. A. **Fencing of dangerous machinery.** *Aust. Timb. J.* 24 (9), 1958 (19 . . . 22). 4 refs.

Quotes British court decisions relevant to section 33 of the Factories and Shops Act, New South Wales, which makes the factory occupier entirely responsible for maintaining adequate fencing of all dangerous parts. Section 36A, which penalizes the employee (without prejudice to the recovery of damages) for not co-operating for safety, has seen 31 prosecutions launched in the past 9 months in N.S.W.

821. Barking

See also Nos. 4639–40.

5176. BAKER, T. N. **The debarking of hardwood.** *Tappi* 42 (2), 1959 (154*A*–156*A*). 6 refs. P.R.

Describes the following range of commercial barkers designed for use with hardwoods: (i) 'Little Beaver'; (ii) 'Coon Hound'; (iii) The 'Mullis Log Skinner'; (iv) The Nicholson Rotobarker; (v)

'Cambio'; and (vi) The 'Impco S-20'. Briefly suggests reasons for the greater difficulty of barking hardwoods as compared with softwoods.

822. Saws and Sawing

See also Nos. 5208–10.

5177. KIVIMAA, E. **Cutting force in frame sawing.** *Pap. ja Puu* 41 (1), 1959 (3–16). [Fi.E.fi.e.] P.R.

In a new method for measuring F, the force interacting between the frame-saw blade and the wood to be sawn, and for observing variations during the reciprocating blade stroke, its components F_1 (the main cutting force $\parallel$ to the blade motion), and F_2 (the thrust force $\perp$ to F_1), are measured separately by two units (illustrated) fitted with strain gauges. The test results obtained show that, with continuous feed, a remarkable % of the work of frame sawing is consumed in the upstroke of the blade and that surprisingly high peaks occur in the cutting-force components during the reciprocating stroke. The difficulties of operating at high feed speeds, partly explained by these force peaks, were largely overcome by changing from spring-set to swaged blades, and at the same time to a greater pitch. The value of the method for investigations of frame sawing and its use, with modifications, for other types of sawing, are discussed. *From author's summary.*

5178. FRONIUS, K. Važnost in praktično ugotavljanje previsa žagnega lista pri polnojarmenikih z enojnim sunkovitim pomikom. **[The practical importance of saw blade overhang, and determination of this for intermittent-feed frame-saws.]** *Les, Ljubljana* 10 (8), 1958 (104–9). [Sloven. e.g.]

Presents formulae, diagrams and examples for calculating optimum magnitude of overhang in relation to feed.

5179. SUGIHARA, H. **An experimental study on the running stability of the double-edge cutting bandsaw blade.** *Wood Res., Kyoto* No. 16, 1956 (49–69). [E.e.]

Describes the results of tests on 6 different bandsaw blades on a 42-in. bandsaw. The effect of tension Q, saw-blade thickness b, radius of tensioning r, angle of forward inclination of the upper wheel α, and feed force P, on the stability of running were examined and compared with theoretical values calculated from the first report [cf. *F.A.* 19 No 4830]. It was found that: the saw blade must hang symmetrically on the wheel if stable running is desired; stability is attained even when α is not zero, Q is small, b is small (thin), and the amount of tensioning equally small. As Q increases, the saw tends to run more symmetrically. With asymmetrical hanging the instability of running increases with b; but the greater the tension the greater the stability.

5180. SUGIHARA, H., *et al.* **[Studies on sawing with a double-edge cutting bandsaw. VI. Sawing experiment. (2).]** *J. Jap. Wood Res. Soc.* 4 (5), 1958 (192–4). 1 ref. [Jap.e.*e.*] P.R.

A perforated (non-tensioned) saw and saws of 23 B.W.G. were tested, the results obtained for different timbers and at different feed rates being given in tables including the mean pulling stress in kg./sq. mm.

5181. FEOKTISTOV, A. E. Vlijanie skorosti rezanija na ustojčivost′ i pročnost′ pilnoj lenty. **[The effect of saw speed on the strength and durability of a bandsaw.]** *Derev. Prom.* 7 (11), 1958 (13–5). 6 refs. [Russ.] P.R.

Bandsaw strength (i.e. resistance of the blade to shear stress and twisting) and service life are calculated by correlating the optimum saw speed (s.s.) and rate of feed (r.f.) and the species and condition (wet, dry, frozen, etc.) of the timber [cf. *F.A.* 18 No. 3354]. Equations are presented, based on theoretical considerations, for optimum pulley-wheel diameters according to the working speed of the saw for a given saw-blade thickness and to the r.f. of the timber, optimum diameters being smaller as s.s. increases. Blade slip from the pulley wheels with consequent twisting and loss of strength is only an indirect result of the s.s., being caused by excessive r.f. or by incorrect angles of feed.

5182. BALLIGAND, E. Note sur l'usinage des bois à la scie à ruban. **[Sawing wood with band saws.]** *Bull. Inst. agron. Gembloux* 26 (1/3), 1958 (3–6). 4 refs. [F.] E.M.B.

Presents the design of an experimental saw blade and formulae for calculating the critical thickness of sawdust particles and rate of feed of the logs in sawing Limba [cf. *F.A.* 17 No. 2015].

5183. CALVERT, W. W. **The short-log bolter. Its use in conversion of Canadian woods.** *F.P.L. tech. Note For. Prod. Lab. Can.* No. 10, 1958. pp. 38. 14 refs.

A comparative study indicating that % conversion into lumber, grade recovery and accuracy were better for bolters than for sawmills and that they were economically superior for dimension stock, particularly from small and inferior hardwoods, despite lower productivity. [Cf. *F.A.* 16 No. 3457; 17 No. 3311.]

5184. ANTOINE, R. La scie statique—apporterait-elle une solution aux illogismes du sciage du bois? **[A static saw—would it remove the present illogicalities in sawing wood?]** *Rev. Bois Appl.* 14 (4), 1959 (47–51). 1 ref. [F.]

From a discussion of conventional saws the author concludes that in theory it would be more logical (*a*) to have a cutting edge in the form of a gouge, (*b*) to cut $\parallel$ to the fibre direction, (*c*) to have thicker chips with increased feed speed and reduced saw speed, (*d*) to provide a channel for chip evacuation, and (*e*) to evacuate the chips by the shortest possible route. Carrying the reduction of saw speed to the logical extreme, the saw would be static. An experimental static saw is illustrated and described: it has two static 'blades', one above the other, each carrying a row of independent diametrically opposed teeth ground like gouges, with each tooth standing higher than the preceding one by the desired chip thickness, so that the space between successive opposing pairs regularly decreases until the final pair touch. Each gouge-shaped tooth has an opening at the end to allow egress of the 'chip'. The timber is simply fed into this 'jaw' between the two static blades and thus 'sawn'. Each tooth will remove, per piece of timber sawn, only one filiform 'chip' which will be 2–4 mm. thick, 1–2 mm. wide, and as long as the piece of timber (hence suitable for paper making). The method and 'saw' are patented. Advantages include: reduced power requirement; excellent sawn surfaces; no sawdust; silent work; virtually no possibility of accident.

823. Planing. Cutting of Mouldings. Chiselling, Mortising and Tenoning. Boring. Turning

5185. CHARDIN, A. Les caractéristiques géometriques des fers de rabots modernes. **[The geometrical characteristics of modern plane-irons.]** *Bois For. Trop.* No. 64, 1959 (35–40). [F.e.span.]

Conditions in which plane-irons are currently used (cutting angle 45°, sharpness angle 24°, clearance 21°) are detrimental to the cutting edge. Experience shows that tools stand up much better if the clearance angle is reduced by one-half. This reduction, however, hinders workmen as the bevel of the tool is no longer wide enough to permit the proper removal of the wire-edge from the tool on the oilstone. It would thus be desirable to revert to the traditional use of thick irons. *From author's summary.*

824. Forms of Joint. Jointing and Assembly

824.8. Glues and Gluing.

See also No. 5370.

5186. **List of publications on glue, glued products, and veneer.** *Rep. U.S. For. Prod. Lab., Madison* No. 513, 1958. pp. 23. P.R.

Lists, under 8 subject heads, the technical notes, processed reports, articles contributed to the trade and technical press, and other government publications issued by the Forest Products Laboratory, Madison.

5187. KNIGHT, R. A. G. **The efficiency of adhesives for wood. Summary 4.** Forest Products Research Laboratory, Princes Risborough. 1959. pp. 20 + 1 tbl. P.R.

Parts I and II deal with glues for plywood manufacture (including an assessment of their durability in Lime and Beech plywood) and for assembly work (e.g. durability in laminated softwood beams, ageing of glued joints set by R.F. heating etc.) respectively. Part III gives a general assessment of the durability of the glues used in the tests, based on data extending over at least 5 years.

5188. TEMKINA, R. Z., PLOTNIKOVA, G. P., and MIKROVIČ, R. A. Napolniteli dlja klejaščih karbamidnyh smol i belkovyh kleev. **[Fillers for urea-formaldehyde and protein glues.]** Central'noe Bjuro Tehničeskoj Informacii Bumažnoj i Derevoobrabatyvajuščej Promyšlennosti, Moscow. 1958. pp. 13 + 1 tbl. 26 refs. [Russ.] P.R.

Describes the preparation and applications of extended urea-formaldehyde [U.F.] resins and protein (albumin-casein and casein) glues in plywood manufacture in the U.S.S.R. Fillers were added to (*a*) U.F. resins, (*b*) casein, and (*c*) albumin-casein glues in the following %s: to (*a*) soya flour, 3; wood flour (comminuted chips and sawdust), 3; hydrolysed lignin waste, 10; ground castor-seed waste, 7; and fodder yeast, 8–10; to (*b*), fodder yeast, 9; and to (*c*) fodder yeast, 7·5; soya flour, 12; and ground castor-seed waste, 13. In gluing experiments with 3-, 4- and 5-ply plywood [working pressures and temperatures stated], the addition of fillers in each case improved the colloidal structure, increased the working life and viscosity and decreased the run-out of glue from the wood surface, and in the roller application of protein glues significantly decreased foaming. A 10–15% saving in basic glue-mix constituents is claimed, the limits of extension permissible for adequate durability being tabulated.

5189. FUKUI, H., and HIRAI, S. **[Studies on laminated woods with sawn boards. V. On the durability of glue joints of urea resin adhesives filled with wood flour in the laminated woods with sawn boards of Sugi (*Cryptomeria japonica* D. Don).]** *J. Jap. Wood Res. Soc.* 4 (5), 1958 (195–200). 11 refs. [Jap.e.*e*.] P.R.

Laminated test pieces (1000 × 66 × 80 mm. and initial m.c. 14%) were tested under various conditions of soaking in water and at different drying rates. Data are presented on the suitability of different glues according to the tensile shear strength and wood-failure values obtained after exposure to accelerated service conditions.

5190. SEVAST'IANOV [SEVAST'JANOV], K. F. **Setting of carbamide resins.** *Transl. Commonw. sci. industr. Res. Organ. Aust.* No. 4061, 1958. pp. 7 + 5 gphs. Transl. by M. Slade from *Derev. Prom.* 7 (2), 1958 (9–11). [See *F.A.* 20 No. 1071.] Limited distribution. P.R.

5191. EGNER, K. **Study of (wood) fibres damaged by acid hardened synthetic resin glues.** *Transl. Commonw. sci. industr. Res. Organ. Aust.* No. 4282, 1959. pp. 6 + 4 plates. Transl. by E. Bolza from *Holz-Zbl.* 78 (135), 1952 (1857–8). [See *F.A.* 15 No. 4143.] Limited distribution.

5192. LAMPERT, H. **The gluing of screen-faced hardboard to solid timbers.** *Transl. Commonw. sci. industr. Res. Organ. Aust.* No. 4103, 1958. pp. 6 + 2 sets of dgms., 3 sets of photos. 4 refs. Transl. by E. Bolza from *Holzindustrie, Berlin* 10 (7), 1957 (229–33). Limited distribution. P.R.

Satisfactory glue joints were obtained using urea-formaldehyde glue with different extenders. Strength of the glue joint was always greater than the shear strength of the hardboard.

5193. SUCHSLAND, O. **The strength of glue joints in wood obtained with minimum glue spread.** *Quart. Bull. Mich. agric. Exp. Sta.* 41 (3), 1959 (577–99).

The effect of glue spread, moisture content and laminating pressure on the shear strength of glue joints using formaldehyde was tested on $\frac{1}{28}$-in. veneers of *Tabebuia donnell-smithii* (sp. gr. 0·47), Ash and *Betula lutea* (sp. gr. 0·64). In the lighter species the shear strength of the glue joint with a spread of 0·3 g./sq. ft. was greater than that of the wood and a different type of bond is assumed to have taken place from that in the denser woods where glue strength was lower than that of the wood.

5194. MARIAN, J. E., STUMBO, D. A., and MAXEY, C. W. **Surface texture of wood as related to glue-joint strength.** *For. Prod. J.* 8 (12), 1958 (345–51). 10 refs.

Discusses the effect of surface roughness, trueness of surface, and structure (density, porosity, cell-wall area), and methods of measuring and expressing these factors. In experiments with butt or short-scarf joints of Douglas Fir, H.F.-glued with resorcinol, the roughest surface tested (sawn by flat-ground saw) produced the strongest joint in tension and impact bending. Surfaces sawn with hollow-ground saws deviated most from the true and produced the weakest joints. No difference was found between joints in which the growth rings were aligned (early wood [e.w.] to e.w.), misaligned (e.w. to latewood [l.w.]) or crossed. In micro-tests with end-glued specimens, pure e.w. joints reached the full tensile strength of solid e.w., whereas pure l.w. joints reached only 10–15% of solid wood strength, and in mixed joints the strength was determined by the weaker e.w. The tensile strength of e.w. and l.w. respectively was determined as ca. 3600 and 15,300 lb./sq. in. for the material investigated, the 35% of l.w. present providing ca. 70% of the total wood strength. Hence the actual strength of all types of joint was similar. The problem of end-gluing is seen as one of providing a satisfactory bond between l.w., or l.w./e.w. surfaces.

5195. KHRULEV [HRULEV], V. M. **Testing the durability of plywood.** *Transl. Commonw. sci. industr. Res. Organ. Aust.* No. 4038, 1958. pp. 7 + 4 gphs. Transl. by M. Slade from *Derev. Prom.* 7 (1), 1958 (4–7). [See *F.A.* 20 No. 1064.] Limited distribution. P.R.

5196. CARRUTHERS, J. F. S. **Heat penetration in the pressing of plywood.** *Bull. For. Prod. Res., Lond.* No. 44, 1959. pp. 22. 10 refs. Price 1*s.* 9*d.*

The theory of heat conduction in slabs of an ideal material has been applied to the bonding of 5-ft.-square plywood in a hot press. At pressing temperatures of 100° C. the theory can be used to determine the heating times of plywood whose constituent veneers had a moisture content < 10% before pressing, but the calculated values should be increased by about 10% to allow for variation in the thermal properties of the wood. At pressing temperatures of > ca. 100° certain other factors intervene, and because of edge effects the theory is not applicable to boards as a whole. In these circumstances, methods of direct temperature measurement are to be preferred. *From author's summary.*

5197. KOVAL'ČUK, L. M. Nepreryvnoe skleivanie drevesiny pri vysokočastotnom nagreve. **[R.F. heating in the continuous [process of] gluing wood.]** *Derev. Prom.* 7 (11), 1958 (9–12). [Russ.] P.R.

[Cf. *F.A.* 20 No. 1077.] In 1955 a series of experiments was conducted in Moscow to determine the gluing parameters (direction of electric field, generator frequency, air-space or 'play' between electrodes and wood, voltage gradient and heating time) necessary to a continuous R.F. heating process. In this, strips of wood were placed on an endless belt and conveyed at feed rates of 0·5–1·1 m./min. via pairs of press-rollers between which electrodes parallel to the glue lines were fitted [cf. *F.A.* 20 No. 1078]. Best results for 40-mm.-thick boards made from 93-mm.-wide strips (10 glue-lines) were obtained at a feed rate of 0·5 m./min., a lateral presssure of 5 kg./sq. cm., and a frequency of 3 megacycles/sec. with 3–3·5 KV being fed to the electrodes; and for boards made from 32-mm. strips (up to 30 glue-lines), at a feed rate of 0·33 m./min. at a slightly lower voltage; in both cases KB-3 phenol-formaldehyde glue was used.

825. Cleaving. Adzing. Mechanical Comminution

See also Nos. 4646–7.

5198. STREHLKE, B. Maschinelles Spalten von Holz. **[Machines for splitting wood.]** *Forstarchiv* 30 (3), 1959 (70–2). 11 refs. [G.]

Gives technical information on 11 German and Swiss makes, classified by type of action (reciprocating or helical), fineness or coarseness of splitting, and size of the wood blocks handled.

826. Peeling. Slicing. Trimming, Edging etc. of Thin Sheets

See also Nos. 5215–6.

5199. KANAUCHI, T. **[On the rotary cutting of small logs. Lathe back-up rolls and results of the operations.]** *J. Jap. Wood Res. Soc.* 4 (6), 1958 (227–31). 2 refs. [Jap.e.*e.*] P.R.

Presents data on holding pressures, veneer thickness and working speeds for different woods in cutting from small-diameter logs. Photographs and a drawing of the twin roller-type machine used are given.

5200. NAKAMURA, G., and SAITO, M. **[Effect of vertical nosebar opening on the qualities of Japanese Beech veneer on rotary cutting.]** *J. Jap. Wood Res. Soc.* 5 (1), 1959 (7–12). 3 refs. [Jap.e.*e.*] P.R.

Indicates the effect of various openings on Beech veneer quality with special reference to lathe checks and surface roughness. An empirical formula is presented for knife angles of 20·5° and 24° and photographs are given showing the veneer surfaces obtained [cf. *F.A.* 20 No. 1083].

827. Bending. Moulding (other than by Cutting)

5201. TURNER, N., and DEAN, A. R. **The reaction of some well-known bending timbers when heated in a radio frequency field.** *Wood* 24 (3), 1959 (97–100).

The maximum R.F. power concentrations that various woods could tolerate without degrade, and the heating periods required to cause them to boil freely were investigated. *Quercus robur*, *Ulmus procera*, and Red Hickory (*Carya* sp.) could not be softened by R.F. heating without grave risk of internal splitting. *Fagus sylvatica*, *Acer pseudoplatanus* and *Fraxinus excelsior* could be so heated, provided that they did not contain abnormal growth features (e.g. black or red heart). Internal splitting was shown to be attributable to tyloses, which impeded the free egress of steam. Limited tests made on *U. glabra*, *U. americana*, *Carpinus betulus*, *Aesculus hippocastanum* and *Juglans regia* are also discussed.

829.1. Finishing

5202. Pahlitzsch, G., and Dziobek, K. Untersuchungen über das Bandschleifen von Holz mit geradliniger Schnittbewegung. **[Investigations on belt sanding of wood with a straight cutting movement.]** *Holz Roh- u. Werkstoff* 17 (4), 1959 (121–34). 8 refs. [G.g.e.] P.R.

Trials were made with samples of *Picea abies*, *Pinus sylvestris*, *Alnus glutinosa*, *Populus × serotina*, *Quercus robur*, *Fagus sylvatica* and *Tectona grandis*. The influence on the sanding process of species, fibre direction, size of sanding area, belt speed, pressure, and fineness of abrasive was investigated by determining the volume of wood abraded. This fell in the order: Alder, Beech, Poplar, Oak, Spruce, Teak and Pine; with constant pressure the abraded volume increased as sanding area decreased, and with constant sanding area it increased as pressure increased. Optimum belt speed seemed to be ca. 30 m./sec. with abrasive size 60 (ASTM), and somewhat less for size 120.

5203. Naslund, G. E., and Hallberg, B. O. **New tool for measuring adhesion of coatings to wood.** *For. Prod. J.* 9 (1), 1959 (23–6).

The apparatus, developed by the Weyerhaeuser Timber Co., measures the energy required to strip a cellophane tape of predetermined adhesive strength off the coated surface, by attaching one end of the tape to a self-recording pendulum. A definite relationship was found to exist between the machine reading in foot-pounds and the % failure of the coating. The paint-holding properties of various types of hardboard varied widely.

5204. Rischbieth, J. R., and Bussell, K. R. **The paint-holding properties of Australian woods.** *Journal of the Oil & Colour Chemists' Association, Cambridge* 40, 1957 (306–20). From *abstr.* in *Prev. Deterior. Abstr.* 16 (3), 1958 (*Wood* 28). P.R.

The relative paint-holding properties of Jarrah, Hoop Pine, Cypress Pine, Spotted Gum, Mountain Ash, etc. were assessed after 4 years' exposure, during which a range of painting systems was tested on each. Results are compared in respect of paints, primers and timbers (species, type of surface and density).

83. Timber Manufacturing Industries and Products. Uses of Wood as Such

831. Fuelwood and Various Types of Rough Timber

See also Nos. 5242, 5249–51.

5205. Sekhar, A. C. **A note on the strength of single-solid and jointed wood poles.** *Indian For.* 85 (5), 1959 (305–9 + 1 dgm.).

Tests were made of strength and stiffness of (*a*) single solid and (*b*) jointed poles (using the 'Russian' joint [illustrated]) of *Shorea robusta*, *Pinus excelsa* and *P. roxburghii*. Average strength of (*b*) was 0·91 and average stiffness 1·02 of that of (*a*).

5206. Fontenelle, A. Paranhos. Relatorio sôbre dormentes de madeiras. **[Report on wooden railway sleepers.]** *Brasil madeireiro* 13 (127–128), 1958 (8–19; 10–7). 28 refs. [Port.]

Presents information on Brazilian species suitable for sleepers, their properties, and, in particular, their durability, discusses the country's resources in such timber, methods of exploitation, extraction and preservation, and finally reviews the general situation in Brazil, with particular reference to the state of the timber industry in Amazonia and the requirements of the country as a whole. The review is based on literature from S. America and the U.S.A.

5207. Costa, T. G. Martins. Produção de dormentes ferroviarios. **[The production of railway sleepers.]** *An. bras. Econ. flor., Inst. nac. Pinho* 10, 1958 (135–49). [Port.]

Discusses the general situation in Brazil with regard to supply and concludes that every railway should have its own forestry section, that a centre for supply should be established in Amazonia, and that it should be obligatory for all sleepers to be given preservative treatment.

832. Mills, Their Functions and Products

832.1. Sawmills and Planing Mills.

See also Nos. 5177 *et seq.*, 5233.

5208. Actes du Congrès International des Scieries. **[Proceedings of the International Sawmilling Congress.]** Fédération Nationale des Scieries, Brussels. 1958. pp. 180. Many refs. [F.] P.R.

An account of proceedings held at Brussels on 1–4 June, 1958. Technical papers read include: Does the static saw offer a possible solution to the illogicalities of sawing wood? (*R. Antoine*) [Cf. *F.A.* 20 No. 5184]; Increasing the cutting life of bandsaw blades: stellite-facing (*Becket* and *Keller*); Present evolution of research on sawing wood (*A. Chardin*); Sawdust and chips or timber (*L. H. Reineke*); Tension and tensioning devices for frame-saw blades (*B. Thunell*); Some problems of sawing resinous timber in Great Britain (*K. J. S. Walker*) [deals with *Pinus sylvestris*, *Picea sitchensis*, *P. abies*, and *Larix decidua*].

5209. Palmer, F. **Steam sawmill centenary [in Finland].** *Timb. Tr. J.* 229 (4315), 1959 (67–70).

Traces the history of log conversion from the Middle Ages (hewing and hand-sawing), water mills (1530) to steam (1859) and developments thereafter, with statistics of mills, acceptable timber dimensions, and production and State efforts to limit it in the interests of conservation.

5210. Walker, K. J. S. **Sawmilling survey. Interim notes on mill and saw types gathered from a literature survey.** Forest Products Research Laboratory, Princes Risborough. [1957?] pp. 8 + 2 dgms. 12 refs. [P.R.]

A glossary classifying sawmills according to type on the basis of their machinery but, because of the great number of possible combinations of machinery, citing only the most popular ones. Notes particularly the development in N. European countries of high-speed framesaws (320–370 rev./min.) for the conversion of small softwood logs. Includes also an entry on the Swedish 'Ari-Sawmilling System', incorporating circular saws, which competes with framesaw mills whose annual production does not justify the continuous running of a pair of frames in tandem [cf. *F.A.* 16 No. 4592].

5211. Hyler, J. E. **Modern sawmilling. Pts. 114–119.** *Sth. Lumberm.* 198 (2472–2477), 1959 (43 . . . 47; 33 . . . 36; 37 . . . 41; 29 . . . 36; 39 . . . 46; 35 . . . 41).

Stacking and piling, including unstacking, steel strapping etc. Kiln drying.

5212. Mater, M. H. **Sawmill automation—the answer to the small log problem.** *Proc. Soc. Amer. For.* 1958 (1959), (23–5).

Includes two sample lay-outs for mills producing 25,000 and 50,000 bd. ft./8-hr. shift (with 3 and 6 workers respectively) from logs averaging $<$ 100 bd. ft./log. Small logs, because of their greater uniformity, are thought to lend themselves better to automatic processes than large. [Cf. *F.A.* 19 No. 4870.]

5213. Kotok, E. S., and Newport, C. A. **Lumber recovery at a Ponderosa Pine sawmill in the Black Hills.** *Sta. Pap. Rocky Mt. For. Range Exp. Sta.* No. 19 (rev.) 1959. pp. 14. 2 refs.

[Cf. *F.A.* 17 No. 4459.] A detailed statistical analysis of 613 logs from 243 trees of all sizes and on all types of site, in order to determine the relationships between overrun (34·9% in this study) and various log or tree characteristics. Two log-grading systems were used and their merits assessed against a log-grading index. Chief characteristics, other than log grade, useful in predicting lumber-grade recovery, appeared to be log and tree size, log position and soundness.

832.2. Veneer and Plywood Mills, including the Manufacture of Composite-Wood Assemblies

See also Nos. 4783, 5132, 5186 *et seq.*, 5199–5200, 5221, 5247–8, 5264.

5214. Koptchev [Kopčev], P. L'industrie du contreplaqué en Bulgarie. **[The plywood industry in Bulgaria.]** *Rev. Bois Appl.* 14 (2), 1959 (28–30). [F.]

Discusses wood used (mainly Beech), methods of manufacture (including gluing schedules), and standard rates of output.

5215. **Trials of timbers for plywood manufacture. Progress Report 51. Nkoba—*Lovoa brownii*—Uganda.** Forest Products Research Laboratory, Princes Risborough. 1958. pp. 13. Limited distribution. P.R.

Data are presented on 5 logs sent to Princes Risborough by the Uganda Forest Department for preliminary appraisal. Details are given of processing trials (duration and temperatures in the treatments, according to veneer thickness), lathe settings, properties of the veneer, drying, and yield measurement.

5216. **Trials of timbers for plywood manufacture. Progress Report 53. African Satinwood—*Fagara macrophylla*—Uganda.** Forest Products Research Laboratory, Princes Risborough. 1958. pp. 12. Limited distribution. P.R.

Describes processing trials made at Princes Risborough. Data are presented on lathe settings, various drying regimes, and yield measurements of the timer.

5217. Kumar, V. B. **Application of statistical quality control methods to veneer drying.** *Pap. ja Puu* 41 (4*a*), 1959 (159–66). 9 refs. [E.e.fi.] P.R.

Presents graphs showing the variation from the mean of moisture contents (measured by moisture meter or oven drying) of Beech or *Vateria indica* veneers dried in different driers. [Cf. *F.A.* 18 No. 3406.]

5218. Richardson, D. W. **Aircraft timber Pt. 6. Aircraft plywoods.** *Journal of the Society of Licensed Aircraft Engineers* 8 (3), 1959 (6–8). From *abstr.* in *Index aeronauticus* 15 (5), 1959 (120). P.R.

Briefly discusses the manufacture of plywood and gives an extract from B.S. specification 6V3 on the physical requirements for this type of plywood.

5219. Wood, L. W. **Sandwich panels for building construction.** *Rep. U.S. For. Prod. Lab., Madison* No. 2121, 1958. pp. 34 + 11 photos, 3 drawings, 1 dgm., 7 tbls. 18 refs. P.R.

Summarizes research at Madison on the use of sandwich panels in housing and other buildings, indicating the range of wood or wood-base facing materials used and presenting formulae for calculating the strength and stiffness of the panels.

5220. Freas, A. D., and Werren, F. **Effect of repeated loading and salt-water immersion on flexural properties of laminated White Oak.** *For. Prod. J.* 9 (2), 1959 (100–2). 2 refs.

Laminated beams, tested dry or after immersion in salt water, including a cyclical exposure to 3 three-month wet and 3 one-month dry periods, showed no appreciable changes in bending strength or elasticity after 9 million cycles of loading to 50% of ultimate strength. The glue bonds also showed no strength loss.

833. Timber in Buildings and Engineering Structures (Manufacture and Use)

833.1. Building Components and Fittings: General

See also Nos. 5110, 5137, 5219.

5221. Luxford, R. F., and Bonser, W. E. **Adequacy of light frame-wall construction.** *Rep. U.S. For. Prod. Lab., Madison* No. 2137, 1958. pp. 5 + 2 dgms., 3 gphs., 2 tbls. P.R.

Discusses and tabulates the results of mechanical tests on Douglas Fir panel-frames sheathed with (1) Southern Yellow Pine horizontal boards and (2) large, exterior-grade Douglas Fir plywood sheets.

5222. **Wood floors.** Timber Development Association, London. [1959?] pp. 32. 28 refs.

A ready-reference booklet for the designer and constructor, including a classification of types, functional characteristics and (both illustrated) insulating materials and details of construction of the main types.

833.2. Special Uses in Residential, Commercial and Public Buildings

5223. Burgess, H. J. **Low-cost timber housing.** *Malay. Forester* 22 (1), 1959 (32–49). 2 refs.

A description is given of the type of low-cost house that is becoming generally accepted as the most suitable for those for whom multi-storey flats are inappropriate. The desirable maximum cost of such a house is estimated and means are suggested for achieving a sufficiently low cost of construction, with special reference to factory prefabrication and to experiments being made at the Timber Research Laboratory [at Kepong]. The aim of the experimental work is to design a timber frame for a house of very low initial cost which can be conveniently 'expanded' later if required. With the possibility of very complete prefabrication and of a 'do it yourself' form of rapid assembly on the site, unorthodox framing methods seem to be required. *Author's summary.*

834. Shingles. Cooperage. Packing Containers. (Manufacture and Use)

See also No. 5252.

5224. Seifert, E. Holzverwendung für Bottiche, Silos und Rohre in chem. Werken. **[The use of wood for vats, silos and pipes in chemical works.]** *Holz-Zbl.* 85 (71), 1959 (926–9). [G.]

A lecture, discussing *inter alia* uses where wood has remained competitive, and where it has been supplanted, species used for various purposes, etc., examples including the smelting, dye-stuff, pulp and electro-chemical industries.

5225. Sallenave, P. Bois tropicaux d'emballage. **[Tropical woods for packing.]** *Bois For. Trop.* No. 65, 1959 (63–70). [F.]

Discusses the properties required in wood for packing cases (either solid wood, veneer, or plywood), and gives notes on a number of tropical species and tabulated data on their strength properties (separately for veneer and plywood) with some European species for comparison. Obeche (*Triplochiton scleroxylon*) has mechanical properties precisely similar to those of Poplar.

5226. Heebink, T. B., and Fobes, E. W. **Hardwood pallet manufacturing.** *Rep. U.S. For. Prod. Lab., Madison* No. 2132, 1958. pp. 25 + 5 drawings, 1 dgm. 10 refs. P.R.

Presents the findings of several surveys made at Madison to determine the types of pallets produced in the U.S.A. and the materials, methods and equipment used, as well as problems and other factors related to the industry.

835. Industrial and Domestic (Utility) Woodware. Toys and Models. Sports and Recreational Goods. Musical, Scientific and Mathematical Instruments. Surgical Applications etc.

5227. **Gun and rifle stocks.** *For. Prod. Newslett. C.S.I.R.O. Aust.* No. 251, 1959 (3).

Adds to the rifle furniture timbers of Boas [see [*F.A.* 10 No. 255], i.e. Coachwood and Queensland Maple, the following: *Ackama muelleri*, *Geissois benthami*, *Dysoxylum fraseranum*, *Nothofagus cunninghamii* and, especially for attractive appearance, *Endiandra palmerstoni* and *Castanospermum australe*.

838. Vehicles (including Ships, Boats, Aircraft)

See also Nos. 5220, 5269.

5228. Thomas, A. V. **Timbers used in motor vehicles.** Forest Products Research Laboratory, Princes Risborough. 1958. pp. iv + 15. P.R.

A survey of the timbers used in the British automobile industry, discussing seasoning and the use of wood preservatives, plywood, fibreboards and particle boards, and describing the range of softwoods and hardwoods used in the various structural, decorative and packaging processes involved.

5229. **Timbers for boat building [in Australia].** *For. Prod. Newslett. C.S.I.R.O. Aust.* No. 249, 1959 (5–8).

[Cf. *F.A.* 10 No. 255.] Lists the species with their densities, availability and decay-resistance ratings, and their States of origin, suitable for: keel, stem, sternpost, gunwale, coaming, and belting (21 spp.); interior framing, deck beams, girders (9); planking (25); decking (8); bent timbers (14); knees (4); gratings (7); oars (11); masts and spars (7).

839.2. Wood Flour and its Manufacture

5230. Müller, W. L. Neuplanung eines Holzmehlwerkes. **[Design of a wood-flour plant.]** *Holz Roh- u. Werkstoff* 17 (3), 1959 (102–14). 4 refs. [G.g.e.] P.R.

The design drawings of a plant producing 8500 tons/year with 3-shift working are given.

839.8. Industrial Waste Wood, its Processing and Uses

See also Nos. 4714, 5321, 5338 *et seq.*, 5366–7.

5231. Arhangel′skij, V. D. Ob obezvoživanii drevesnyh othodov. **[Pressing out water from wood waste [before drying proper].]** *Derev. Prom.* 7 (11), 1958 (5). [Russ.] P.R.

Discusses a method for the mechanical extraction of moisture from wood waste in the 80–120% m.c. range, involving the use of an experimental rig specially adapted from two conventional crawler tracks placed one above the other and driven by a 12-KW motor. Working speed and pressure of the rig were 13 m./sec. and 6 kg./sq. cm. respectively, the treated material being discharged from the end of the tracks. It was claimed that the m.c. of the 2·5–3 tons of material thus treated was reduced from 80 to 32–35% in 8 hours.

5232. ASKEW, H. O., STANTON, D. J., and WOODS, G. F. **A sawdust and cover crop experiment.** *Rep. Cawthron Inst. 1957/58*, 1958 (27–30).

Experiments were made to determine the effect on wheat yield of previous treatments with a sawdust mulch [Pine?] at 10 and at 20 tons/acre, with and without the addition of an N fertilizer, combined with (*a*) fallowing, (*b*) a cover crop of lupins, or (*c*) a cover crop of rye. Yields on (*a*) and (*b*) plots were similar when no sawdust or 10 tons/acre were used, but at 20 tons of sawdust (*b*) fell below (*a*). On (*a*) plots there was a steady decrease from no sawdust, through 10 tons to 20 tons of sawdust, and the use of N fertilizer was not beneficial. Rye was not successful, measured by wheat yield, as a cover crop even when no sawdust was used, and in the presence of sawdust gave very low yields.

5233. Bunting og transport av bakhon. IV & V. **[Bundling and transport of slabs and edgings. IV & V.]** *Inform. Skogbr. Skogind. Forskn. Foren.* (*Transportutv.*) Nos. 79 & 80, 1959. pp. 4; pp. 2. [Nor.]

(IV) Bundling and loading bundles for conveyor-belt and rail-wagon transport within the mill. (V) Strapping and stacking of bundles. [Cf. *F.A.*19 No. 3590.]

84. Preservation and Other Treatments to Improve the Properties of Wood. Damage by Biological Agencies and its Control. Seasoning. Timberyard Practice

841. Wood Preservation

See also Nos. 4405, 5263, 5269, 5278, 5329, 5354.

5234. **Record of the 1958 Annual Convention of the British Wood Preserving Association, Cambridge, July 8th–11th 1958.** *Rec. 1958 Conv. Brit. Wood Pres. Ass.* 1958. pp. ix + 190 + many photos, gphs. & tbls. P.R.

Contains the following papers with discussion and summing-up: A marine exposure test of chemically impregnated poles and untreated controls in South African harbours (*P. M. D. Krogh*; pp. 1–5); The permeability of wood and its importance in timber preservation (*D. N. Smith*; pp. 31–42); Penetration of preservatives into refractory wood (*V. Rubeš*; pp. 56–70) [see *F.A.* 20 No. 5244]; Some curiosities of fungal and insect attack on timber (*C. Sisley*; pp. 75–83); Treatment of timbers against attack by insects and fungi in warm climates (*D. Boocock*; pp. 93–109); On some organic solvent types of timber preservatives in Germany (*G. Becker*; pp. 123–42) [cf. *F.A.* 18 No. 4682]; Some experiments with oscillating pressures in wood impregnation (*S. T. Henriksson*; pp. 154–69).

5235. DIETRICHS, H. H. **Studies in the field of wood-preserving chemistry. Part VIII. Paper chromatography and analysis of wood preservatives.** *Transl. Commonw. sci. industr. Res. Organ. Aust.* No. 4621, 1958. pp. 11 + 4 dgms., 1 gph. 37 refs. Transl. by W. Knie from *Holz Roh- u. Werkstoff* 16 (9), 1958 (340–6). [See *F.A.* 20 No. 2453.] Limited distribution.

5236. JONAS, G. Z. **Leaching and fixing of U- and UA-salt preservatives in wood.** *Transl. Commonw. sci. industr. Res. Organ. Aust.* No. 3927, 1958. pp. 12 + 8 gphs. 6 refs. Transl. by M. Slade from *Holz Roh- u. Werkstoff* 15 (10), 1957 (418–23). [See *F.A.* 20 No. 2457.] Limited distribution. P.R.

5237. SHIBAMOTO, T., INOUE, Y., and KENJO, Y. **[Studies on water-borne wood preservatives. IV. On the application of the cup method for assaying the inhibitory effect of water-borne wood preservatives on the growth of fungi.]** *J. Jap. Wood Res. Soc.* 4 (5), 1958 (165–70). 12 refs. [Jap.e.*e.*] P.R.

[Cf. *F.A.* 20 No. 1136.] Gives tabulated data in English on control of *Poria vaporaria*, *Trametes sanguinea* and *Irpex lacteus* in *Cryptomeria japonica*, using various F compounds and nitrophenols.

5238. SHIBAMOTO, T., and INOUE, Y. **[Studies on water-borne wood preservatives. V. The effects of pH of treating solution of chloro- and nitrophenol preservatives upon antifungal activities.]** *J. Jap. Wood Res. Soc.* 4 (5), 1958 (171–5). 11 refs. [Jap.e.*e.*] P.R.

[Cf. *F.A.* 20 No. 1136.] Presents data in tables and graphs, in English.

5239. SHIBAMOTO, T., and INOUE, Y. **[Studies on water-borne wood preservatives. VI. Prevention of mold growth on Bamboo stem treated with antifungal chemicals.]** *J. Jap. Wood Res. Soc.* 4 (6), 1958 (237–42). 20 refs. [Jap.e.*e.*] P.R.

[Cf. *F.A.* 20 No. 1136.] Describes laboratory tests in which a mixed fungal spore suspension of *Aspergillus flavus* and *Penicillium citrinum* was applied to the surface of test pieces of *Phyllostachys pubescens*, previously boiled for 30 min. in treating solutions of 0·5% *p*-nitrophenol or 2% Na pentachlorophenate. Data on results obtained are tabulated in English. Field tests were also carried out.

5240. SHIBAMOTO, T., INOUE, Y., AND KENJO, Y. **[Studies on water-borne wood preservatives. VII. The result of evaluation of wood preservatives against decay of wood. (Part 1).]** *J. Jap. Wood Res. Soc.* 5 (1), 1959 (31–8). 19 refs. [Jap.e.*e.*] P.R.

Presents extensive data [tabulated in English] on the effectiveness of 48 different preservatives [composition of each tabulated in English] for controlling *Poria vaporaria* in *Cryptomeria japonica*. Tables indicating the effective values of the preservatives are given.

5241. GEWECKE, H. Baumsaft als Lösungsmittel für Imprägniersalze bei der Tränkung von Mastenhölzern nach dem Trogsaug-, Kesseldrucksaug- oder Stapelsaugverfahren. **[Tree sap as a solvent for preservative salts used for preserving poles by the steeping/vacuum-cap, pressure/vacuum-cap, and pressure-sleeve/vacuum-cap processes.]** *Holz Roh- u. Werkstoff* 15 (10), 1957 (416–7). [G.e.] P.R.

[Cf. *F.A.* 20 No. 1143.] Evidence is presented, from tests with 4 decay fungi, to show that the mixture of sap and preservative obtained by the author's modifications of the Boucherie process can be used satisfactorily as an impregnant.

5242. KANEHIRA, Y., and NAKAJIMA, S. **[Creosote penetration in ties.]** *Wood Ind., Tokyo* 14 (3), 1959 (16–20). [Jap.e.] P.R.

Presents results, in tabulated form, of tests conducted in Japan over several years to determine treating procedures and to establish inspection standards for creosoted railway sleepers. Optimum seasoning periods are suggested for the woods used.

5243. SEGUERRA, J. B. **Sub-project P. 10–4. Investigation of the absorption and penetration of preservatives in Australian timbers. Progress Report No. 1. Experiment P. 10–4/3. Effect of treatment variables on the impregnation of Karri (1958). (First report).** Division of Forest Products, C.S.I.R.O., Melbourne. 1958. pp. 10 + 3 photos, 3 gphs., 3 tbls. Limited distribution. P.R.

Describes an investigation of the effect of pressure (steady and fluctuating), temperature and preheating of the wood on the retention and penetration of water-borne preservative and creosote in scantlings of *Eucalyptus diversicolor*, the heartwood of which is recognized as difficult to treat at normal pressure. Retention and penetration increased in proportion to pressure and application period, and were considered satisfactory for creosote at 1000 lb./sq. in. There was no improvement from using alternating pressures; even preheating, and raising the creosote temperature from 160 to 200° F., produced very little increase in absorption. *From author's abstract.*

5244. RUBEŠ, V. **Penetration of preservatives into refractory wood.** *Rec. 1958 Conv. Brit. Wood Pres. Ass.* 1958 (56–70). P.R.

Laboratory studies were made on the penetration of liquid preservatives into refractory wood to determine the degree of treatability, using the following methods of treatment: (*a*) osmotic-diffusion, (*b*) pressure, (*c*) pressure and simultaneous diffusion, and (*d*) steam phase treatment. In (*a*), penetration depth was recorded on photographic films by a new method involving the use of $BaCl_2$ and X-rays. Final rates of diffusion were rather low, and, from data tabulated, slowing down with time was attributable to the decreasing concentration of the preservative diffusing into the wood. In (*b*), tests were made in which (i) filtered and unfiltered aqueous solutions of $ZnCl_2$, and (ii) distilled water, were forced through cylindrical specimens (length 18·5, diam. 9 cm.) of 'marbled' Beech heartwood (m.c. 34%) for 10 min., the quantity of liquid passing through the wood being determined at minute intervals. Absorption/time curves indicated that penetration increases with pressure where the solutions are free from dispersed particles; the greatest decrease in permeability is due to the dispersed particles but it is very difficult to determine the relation between tyloses and dispersion of the preservative solutions because of the variability of the latter and the variable permeability of Beech heartwood. In (*c*), pressure treatment with aqueous solutions (greater penetrability in wood than oil) was followed by osmotic diffusion of the preservative into the wood, a slow process, requiring a m.c. of $\nless$ 30%, and during which the treated wood must lose water very slowly by evaporation. A specimen of 'marbled' heartwood (m.c. ca. 50%) was injected with $BaCl_2$ (34% water by wt.) by means of a hollow needle and bore-holes. The mathematical relations obtained from a study of X-ray photographs indicated a four-fold increase after 11 months in the volume of the cylindrical zone treated, the high degree of impregnation resulting from a high preservative concentration and the constant, relatively high, m.c. of the wood. The principle of (*d*) consists in the sorption of steam-borne volatile fungicides by very dry wood. Vapour mixtures of water and fungicides passing into an impregnation chamber provided with thermometers and pressure gauges were absorbed by specimens of Beech and Spruce heartwood, but before large-scale practical application of this method is possible, fungicides with the following properties will have to be found: (i) low boiling point; (ii) high toxicity; and (iii) possibility of subsequent devolatilization, possibly by fixation in the wood after the complete treatment.

5245. WALTERS, C. S. **Soaking treatment of Basswood at low temperatures as affected by temperature and viscosity of solution, wood moisture, and type of treatment.** *Bull. Ill. agric. Exp. Sta.* No. 633, 1958. pp. 51. 40 refs.

Describes a factorial experiment with sapwood samples (blocks or wafers) of 7 to 28% m.c., soaked in PCP solutions at 50 to 80° F. continuously or intermittently for 12 hours. Results were highly complex. Absorption and PCP retention were highest at the highest temperature and highest m.c., but lowest at medium values of both (40° and 20% m.c.). Absorption and retention were higher in continuous than in intermittent soaking, and higher with less viscous solvent (diacetone alcohol) than with a more viscous one (hexylene glycol). Wafers showed slight radial shrinking and tangential swelling, suggesting an interchange of moisture and solvent in the cell-wall capillaries. The reasons for the observed behaviour are discussed. *From author's summary.*

5246. MATHIEU, H. Traitement du bois par la méthode du 'forage des trous'. **[Preservative treatment of [building] timbers by drilling holes.]** *Bois et Scieries, Numéro spécial 'Foire de Paris'*, 1959 (47 . . . 51). [F.]

Describes, with illustrations, the German method of treating building timbers *in situ* by injection under pressure into drilled holes. [Cf. *F.A.* 20 No. 3836.]

5247. COUDREAU, J. Un procédé par aspersion pour la préservation des contreplaqués contre les piqûres blanches. **[A sprinkling process for protecting plywood from *Lyctus* attack.]** *Bois For. Trop.* No. 64, 1959 (41–7). [F.e.span.]

Describes, with diagrams, an installation in use at the Gergovia factory, which manufactures plywood from tropical African timbers, many of which are very susceptible to *Lyctus* attack. It is an adaptation of the standard Australian practice by which veneer as it comes off the peeler is immersed in a solution of Na borate. In the French factory, the veneer is treated by sprinkling instead of immersion and the solution used is a mixture of H_3BO_3 and Na borate.

5248. COULOMBEAU, M. Traitements de préservation des placages de Samba. **[Preservative treatments for *Triplochiton scleroxylon* plies.]** *Rev. Bois Appl.* 14 (3), 1959 (53–4). [F.]

Briefly describes five methods of applying preservative (a solution of 4% H_3BO_3 and 0·4–0·5% Na borate) to Samba plies.

5249. WARRELMANN, E. **Findings about oil- and salt-impregnated timber poles on the basis of the statistics of a large electric power board.** Translation Service, Department of Internal Affairs, Wellington. 1958. pp. 8 + [7]. Transl. from *Elektrizitätswirtschaft, Frankfurt am Main* 55 (23), 1957 (869–74). [See *F.A.* 19 No. 1066.] Limited distribution.

5250. SMITH, D. N., and COCKCROFT, R. **The loss and movement of creosote in pressure-treated timber during service. Examination of two creosoted posts after 30 years.** *Wood* 24 (6), 1959 (232–6). 10 refs.

Two *Pinus sylvestris* posts (dimensions tabulated) were treated by (*a*) the full-cell, and (*b*) the empty-cell process, and erected in 1928. Examination 30 years later showed that the average loss of creosote was much greater above ground than below, and results suggest, besides evaporation losses, a downward movement of creosote towards the butt. In the vicinity of the ground line there was a steep gradient in the mean average concentration of creosote. Original retention in (*a*) was 29·7, and in (*b*) 7·9 lb./cu. ft. (calculated on the sapwood volume). After 30 years, mean creosote loading in (*a*) had fallen to 18% of the original value above ground and to 85% below, and in (*b*) to 36% above, whereas below ground it had increased by 28%. The probable reasons for this behaviour are discussed.

5251. LINNASALMI, A. **Phytotoxicity of wood preservatives and possibilities of using them in greenhouses and benches.** *Vaaltion Maatalouskoetoiminnan Julkaisuja, Helsinki* No. 166, 1958. pp. 40. 23 refs. [E.e.fi.] O.R.E.

Tests were made with (1) water-soluble salts, (2) oil and oil-soluble preservatives, and (3) solvents (kerosene and turpentine). Injuries to plants in the greenhouse are caused by substances passing directly into the soil, or vaporizing into the air or dissolving into drip or irrigation water. (1) did not generally damage plants through soil or air; Boliden and Wolman salts caused injury when dissolved in drip water; Celcure and Lahontuho K33 proved practically harmless. (2) and (3) did no injury if the treated wood was entirely covered with soil, but some substances (notably creosote and PCP) caused injury through vaporization. Wood tar and kerosene also caused some injury. Damage may be prevented by varnishing treated wood. Cu naphthenate compounds and turpentine were harmless. The susceptibility of plants varied. *From auhtor's summary.*

5252. VERRALL, A. F. **Preservative moisture-repellent treatments for wooden packing boxes.** *For. Prod. J.* 9 (1), 1959 (1–22). 8 refs.

Reports on tests, started in 1952, with 16 main preservatives (generally in 3 concentrations), 4 solvents, and several water repellents, mostly applied as a 3-minute dip. The main series involved 3000 ammunition boxes, chiefly of Eastern White Pine, stored under various conditions of exposure in Wisconsin (*W*), Panama (*P*) and Mississippi (*M*). Supplementary tests with simulated boxes were made in (*M*), and a few boxes given pressure treatment (p.t.) for comparison. Chief results included the following: None of the dip treatments was satisfactory against termites, and the success of p.t. depended on wood species etc., but soil poisoning with DDT gave good protection. In (*W*), p.t. and 6 dip preservatives gave almost complete protection against decay for 5 years. In (*M*), dips and p.t. with Cu naphthenate (2% Cu) (*a*), 5% Cu pentachlorophenate (*b*), and 11·4% Na pentachlorophenate gave best protection; in (*P*) only (*a*), (*b*) and 10% tetrachlorophenol (*c*) gave appreciable protection for 4–5 years. Five % PCP plus water-repellent also reduced the decay rate, particularly of Douglas Fir; (*b*) and (*c*) were considered too corrosive. In (*P*), many boxes pressure-treated with inorganic salts developed surface soft rot. Water repellents did not consistently or importantly reduce decay, but reduced moisture content for periods up to 2 years. Untreated boxes, stored on poisoned soil under tarpaulin, had satisfactory service lives—ca. 3 years in (*P*), 5 in (*M*) and more in (*W*)—but wire-bound crates of rotary-cut Southern hardwood veneers deteriorated rapidly when untreated and, when treated, absorbed so much preservative that contents were affected. [Cf. *F.A.* 17 No. 4497.]

5253. KAMPF, W.-D. Zur Prüfung von Holzschutzmitteln gegen die marinen Holzbohrasseln der Gattung *Limnoria* im Laboratorium. **[Laboratory tests of wood preservatives against marine borers of the genus *Limnoria*.]** *Anz. Schädlingsk.* 32 (3), 1959 (38–40). 10 refs. [G.g.e.]

Proposes modifications in the test process of Becker and Schulze [cf. *F.A.* 13 No. 1625]. The use of smaller dishes and wood test specimens (the latter 5 × 10 × 25 mm.) increases the probability of attack. The highly creosote-resistant *Limnoria tripunctata* is used as a test species.

5254. RENNERFELT, E. **The wood preservation committee's field and decay chamber experiments. Report No. IV.** *Medd. SkogsforsknInst., Stockh.* 48 (6), 1959. pp. 37. [Sw.E.sw.e.]

[Cf. *F.A.* 16 No. 2348.] In the 4 years since the last assessment, several series of stakes have had to be condemned, but the relative positions of preservatives have not changed, K33 continuing about equal to creosote as the most effective.

842. Treatments to Improve the Resistance of Wood to Physical and Chemical Agencies

See also No. 5111.

5255. SADOH, T., and KADITA, S. **[Studies on the dimensional stabilization of wood. V. On the**

cyanoethylation of wood.] *J. Jap. Wood Res. Soc.* 5 (1), 1959 (4–7). 2 refs. [Jap.e.*e*.] P.R.

Beech-wood specimens 100 × 15 × 2 mm. were pretreated by immersion in 10% NaCH aqueous solution for 1 hour before undergoing cyanoethylation using acrylonitrile (AN) and NaOH as a catalyst. The treated specimens were neutralized with 5% CH_3COOH, washed in water and dried. The properties and the anti-swelling efficiency of the treated wood are tabulated and graphs are given indicating (1) the following relationships: relative humidity/m.c., r.h./tangential swelling, and N content/sorption ratio; and (2) the sorption processes of the treated woods after various organic liquid treatments.

5256. GOTO, T., and KADITA [KAZITA], S. **[Studies on the impregnated woods. X. Effect of the hardening process of resin on the dimensional stability of phenolic resin-impregnated wood.]** *Wood Res., Kyoto* No. 16, 1956 (1–15). 16 refs. [Jap.e.]

[For Pt IX see *F.A.* 18 No. 4688.] Results of tests with vacuum-impregnated (phenolic resin) test-pieces of *Chamaecyparis obtusa* and *Betula nikoensis* showed that: (1) as the curing temperature was varied from 30 to 160° C., the shrinkage resistance first dropped to a negative value and, after passing through a minimum, steadily rose, whereas the 'resin-forming efficiency'—

$$1 - \left(\frac{a-b}{a}\right) 100\%$$

(where *a* is the resin content before, and *b* that after immersion in water for 10 days) increased with temperature right from the start; (2) for each of the temperatures 100, 120, 140 and 160°, both the shrinkage resistance and the resin-forming efficiency increased as the time of curing increased.

843. Fireproofing and Fire Resistance

5257. BROWN, F. L. **Theories of the combustion of wood and its controls.** *Rep. U.S. For. Prod. Lab., Madison* No. 2136, 1958. pp. 59 + 10 tbls. 140 refs. P.R.

A survey of literature dealing with the fundamental mechanisms of the pyrolysis and combustion of wood and of their alteration by added chemicals. The chemical theories propounded show promise of achieving good fire resistance with smaller expenditure of chemicals than past empirical methods have required.

844. Attack by Plant Organisms

See also No. 4631.

844.1. Sap-staining and Mould Fungi

See also Nos. 4597, 5239.

5258. ELLWOOD, E. L., and ECKLUND, B. A. **Bacterial action in pond-stored logs.** *Nature, Lond.* 183 (4669), 1959 (1206). 1 ref.

Extreme porosity was found in sapwood lumber produced from logs of *Pinus ponderosa* and *P. lambertiana* that had been stored in a pond for 1 month. Investigation showed that bacteria operating under anaerobic conditions rapidly increased the permeability of the sapwood without substantially affecting its strength. The attack was characterized by: (1) removal of parenchyma ray cell contents; (2) corrosion and eventual destruction of parenchyma, particularly in ray tissue. At least one group of the destructive bacteria was identified as *Aerobacillus polymyxa* (flax-retting bacteria) and related species. Unidentified bacteria in pond-stored logs have been previously reported in connexion with brown-stain development in Pine [cf. *F.A.* 20 No. 1194].

844.2. Wood-destroying Fungi

See also Nos. 4778–86, 5112, 5143, 5229, 5234, 5237–8, 5240, 5270, 5303.

5259. CARTWRIGHT, K. ST. G., and FINDLAY, W. P. K. **Decay of timber and its prevention.** H.M. Stationery Office, London. 2nd ed. (rev.) 1958. pp. 332 + 57 plates. Many refs. Price £2. 7*s*. 6*d*.

[Cf. *F.A.* 9 No. 2274.] The general plan is very little altered, but recent research, e.g. on soft rot, is included.

5260. NOBLES, M. K. **Cultural characters as a guide to the taxonomy and phylogeny of the Polyporaceae.** *Repr.* from *Canad. J. Bot.* 36, 1958 (883–926). 69 refs.

Classifies 252 species from their cultural characteristics, including the effect of the fungi on the substrate, usually wood, and divides the family into two major groups, (*a*) a primitive and (*b*) a more advanced group composed of species producing extracellular oxidase. In the wood-inhabiting Agaricales, (*a*) is associated with brown rot, (*b*) with white rot. An annotated key is presented with an index to specific names.

5261. MIZUMOTO, S. **[Studies on *Lenzites abietina* and some of its allied species. (XII). On the influence of culture duration. (XIII). The effect of certain nitrogen compounds upon the decay of Japanese Red Pine heartwood (*Pinus densiflora*) caused by *L. abietina* Fr., *L. subferruginea* Berk., *L. trabea* (Pers.) Fr. and *L. saepiaria* (Wulf.) Fr.]** *J. Jap. For. Soc.* 39 (11; 12), 1957 (438–41; 471–3). 12 refs. [Jap.jap.e.*e*.]

Decay was not uniform in time. Sudden increases in decay % occurred after 120 days for *L. abietina* and *Polystictus sanguineus*, after 240 for *L. subferruginea* and *L. saepiaria*, and after 300 for *L. trabea* and *Poria vaporaria*. N compounds, particularly organic ones, added in small quantities to the nutrient medium, increased the rate of decay; large quantities retarded it. *From author's summary.*

5262. HARTLEY, C. **Evaluation of wood decay in experimental work.** *Rep. U.S. For. Prod. Lab., Madison* No. 2119, 1958. pp. 53 + 4 tbls. 72 refs. P.R.

Critically analyses the literature on the amount and consistency of the effects of fungi on different properties of wood. The following test species are cited: *Peniophora gigantea Fomes pini, F. laricis, F. annosus, Poria monticola, P. vaillantii, P. vaporaria, P. incrassata, Trametes serialis, Polystictus versicolor, P. abietinus, P. hirsutus, Polyporus hispidus, P. schweinitzii, P. tulipiferae, Lenzites trabea,* *L. saepiaria*, *Merulius lacrymans*, *M. silvester*, *Lentinus lepideus*, *Coniophora puteana*, *Stereum rugosum*, *Schizophyllum commune*, *Graphium* and *Ceratostomella* spp. The author finds that: (1) weight loss is still the best all-round non-destructive criterion, despite the time-lapse involved; (2) dimensional shape on oven-drying is a useful supplement for certain brown-rot/host combinations; (3) the best substitute is the toughness test [cf. Trendelenburg, *F.A.* 5 p. 39].

5263. COSTA, E. W. B. DA. **Abnormal resistance of *Poria vaillantii* (D.C. ex Fr.) Cke. strains to copper-chrome-arsenate wood preservatives.** *Nature, Lond.* 183 (4665), 1959 (910–1). 2 refs.

One strain of *P. vaillantii* used at Melbourne was found to be unaffected by these preservatives at the usual concentrations, and the tolerance of various strains of the species was therefore investigated. Initial tests with a typical proprietary preservative of the copper-chrome-arsenate type showed that this high tolerance was not shared by other *Poria* spp. of similar habit, or indeed by all strains of *P. vaillantii.* There were, however, 3 tolerant strains of very diverse origin, the most tolerant being *DFP* 4443 which had been isolated originally from *Pinus radiata* treated with a copper-chromate preservative. Further tests with this strain showed that its resistance to Cu, Zn, and As is very high. It is even more tolerant of As than *Lenzites trabea*, which is widely used as an As-tolerant fungus in testing wood preservatives. It is presumably this high tolerance of As that distinguishes the strains found here to be tolerant of copper-chrome-arsenates from the *Poria* strains used elsewhere in tests of these preservatives.

5264. **White pocket for 'D' grade [plywood].** *Veneers & Plyw.* 53 (2), 1959 (8–9, 14–6). P.R.

Although timber containing the red-heart stain so characteristic of the incipient stages of *Fomes pini* decay is acceptable under present U.S. veneer grade standards, 50–60% of the extensive virgin stands of Douglas Fir in N. California and S. Oregon are regarded as cull owing to the prevalence of 'white pocket', the more advanced stage of *F. pini* decay. Tests made at Madison to determine the bending strength and stiffness, shear strength, shock resistance and nail-holding power of 3- and 5-ply plywood made from ⅛-in. white-pocket veneer showed it to be up to the standard of present grade-D veneer (used only for sheathing and interior-type plywood made with moisture-resistant glues). The results obtained are being used to establish a revision of the commercial standard of Douglas plywood.

5265. CZAJA, A. T., and POMMER, E. H. Untersuchungen über die Keimungsphysiologie der Sporen holzzerstörender Pilze: *Merulius lacrymans* und *Coniophora cerebella.* I. Die Sporenkeimung *in vitro*. **[The physiology of germination of spores of wood-destroying fungi: *M. lacrymans* and *C. cerebella*. I. Spore germination *in vitro*.]** *Qualit. Plant. Mater. Veg.* 5 (3), 1959 (209–67). 41 refs. [G.g.e.] E.M.B.

Presents the results of tests of various substances as stimulants of spores *in vitro*.

5266. ERB, W. Beiträge zur Physiologie der Gattung *Merulius.* **[The physiology of the genus *Merulius*.]** *Repr.* from *Zentralblatt für Bakteriologie, Parasitenkunde, Infektionskrankheiten und Hygiene, Jena* (*Abteilung* 2) No. 111, 1958 (505–29). 72 refs. [G.g.] P.R.

Investigates the physiological reactions of 5 species of *Merulius* (not *M. lacrymans*) to numerous C and N sources, and the antibiotic effect of *Merulius* pigments and mycelia against 8 different species of bacteria.

5267. AKAI, S., and UEYAMA, A. **Relation of temperatures to the wood-decay and wood-rotting activity of *Trametes sanguinea* and *T. dickinsii*** *J. Jap. For. Soc.* 39 (11), 1957 (442–6). 9 refs. [E.e.jap.]

In the experiments described, mycelial growth was fastest between 32° and 40° C., with a possible optimum around 38°, for *T. sanguinea*, and between 28° and 32° for *T. dickinsii.* Cellulose decomposition, when the fungi were allowed to develop at different temperatures, corresponded to mycelial growth, but the ratio of cellulose dissolved and unit weight of mycelium developed, suggested that enzyme reaction was greatest at 36–40° for both fungi. Decay of wood was most rapid at temperatures slightly below the maxima for mycelial growth.

5268. BAKSHI, B. K., SINGH, B., and GIBSON, S. **Occurrence of *Trametes sepium* in India.** *Repr.* from *Canad. J. Bot.* 36, 1958 (604–6 + 1 plate). 5 refs.

T. sepium is reported for the first time in India from the temperate region of the Western Himalayas on bridge timbers of *Cedrus deodara.* The sporophores of the fungus and the cultures are described. Its identity was confirmed by interfertility tests between the Indian and American collections.

5269. BECKER, G., and KOHLMEYER, J. Holzzerstörung durch Meerespilze in Indien und ihre besondere Bedeutung für Fischereifahrzeuge. **[Destruction of wood by sea fungi in India, and its special significance for fishing boats.]** *Archiv für Fischereiwissenschaft, Braunschweig* 9 (1), 1958 (29–40). 23 refs. [G.g.e.] W.P.L.

Along the Coromandel coast catamarans made from light woods such as *Melia composita*, *Albizzia moluccana*, *Bischofia javanica* and *Erythrina* sp., need replacement or repair after 2–7 years, on account of damage by sea fungi (Ascomycetes and Fungi Imperfecti), which decompose the cell-wall cellulose. Damage extends very deep because of the lightness and good ventilation (wide lumens) of the timbers used. The type of damage, and *Halosphaeria quadricornuta*, one of the more important Ascomycetes involved, are described in detail, and some other sea fungi more briefly. The extreme difficulty of finding and applying suitable preservatives is discussed: the method must give very deep penetrations, and the preservative must be highly resistant to leaching, and harmless to the fishermen (who sit almost naked in their craft).

845.1. Marine Borers

See also Nos. 5234, 5253.

5270. RAY, D. L., and STUNTZ, D. E. **Possible relation between marine fungi and *Limnoria* attack on submerged wood.** *Science* 129 (3341), 1959 (93–4). 6 refs. O.R.S.

No evidence was found, either with wood samples submerged in the sea or with laboratory cultures, that preliminary attack by marine fungi is necessary for establishment of attack by *Limnoria*. Detailed results will be published elsewhere. [Cf. *F.A.* 19 No. 2447.]

5271. OLIVER, A. C., and WOODS, R. P. **Interim report of T.D.A. tests at Shoreham. Resistance of timber to marine borers.** *Timb. Technol.* 67 (2240), 1959 (265–7). 5 refs.

Describes the type of damage caused by *Teredo* and *Limnoria* spp. In the tests, begun in 1950, 23 species of tropical woods have been examined, for periods of immersion from ½ to 6 years. At least 4 years' immersion is necessary to be certain that a species is resistant to marine borers. Only 5 species (4 Leguminosae: *Afrormosia elata*, *Dicorynia paraensis*, *Cyclicodiscus gabunensis* and *Zylia dolabriformis*; 1 Rubiaceae: *Sarcocephalus diderrichii*) showed any degree of resistance. Their density ranges from 43 lb./cu. ft. (*A. elata*) to 61 (*X. dolabriformis*) at 12% m.c., and none save *D. paraensis* has SiO_2 inclusions. All have high natural durability against fungi, suggesting that toxic substances may be responsible for their resistance to marine borers. The limitations of the Shoreham tests (non-tidal harbour, size and arrangement of the test blocks, etc.) are discussed. Results should be further tested by full-scale service trials in other parts of the country.

5272. BAVENDAMM, W. Welche Tropenhölzer sind gegen Meerwasserschädlinge resistent und können für den marinen Wasserbau empfohlen werden. **[Tropical timbers resistant to marine borers that can be recommended for marine structures [in German waters].]** *Holz-Zbl.* 85 (12), 1959 (133–4). 16 refs. [G.]

A preliminary annotated list based on the literature, viz.: Angélique (*Dicorynia* spp.), Billian (*Eusideroxylon zwageri*), Greenheart, Jarrah, Lara (*Metrosideros vera*), Manbarklak (*Eschweilera longipes*), Mora, Turpentine (*Syncarpia* spp.) and, less durable, Azobé (*Lophira* spp.) and Bilinga (*Sarcocephalus* sp.).

845.2. Terrestrial Borers

See also Nos. 4569, 4927–31, 5234, 5247–8.

5273. **Host range and preference [of ambrosia beetles]; relative susceptibility of commercial timbers [in Ghana].** *Rep. W. Afr. Timb. Borer Res. Unit 1955/58*, 1959 (11, 13–7).

Generally no clear host specificity is shown, but 7 species (from the genera *Doliopygus*, *Platypus*, *Eccoptopterus* and *Xyleborus*) have so far been found on one host only. Small girth appears to preclude infestation by the larger ambrosia beetles (e.g. *Doliopygus conradti*), whereas the smaller Scolytidae attack small branches and twigs and large-girthed logs equally easily and successfully. *Eccoptopterus sexspinosus* (apparently specific to *Albizzia* spp.) is found only on barked logs, and *Trachyostus schaufussi* only on unbarked logs; with other species of beetle the presence or absence of bark seems to be immaterial. Relative susceptibility of timber species was tested by a method similar to that used in 1955 [see *F.A.* 19 No. 2455]. Results for 20 species are tabulated. No species was immune, most fell into the category of moderate to high susceptibility and *Nesogordonia* [*Cistanthera*] *papaverifera*, *Turraeanthus vignei*, *Entandrophragma utile*, *E. candollei*, and *Guarea cedrata* showed markedly low, and *Antiaris africana*, *Chlorophora excelsa*, *Albizzia* spp., *Pycnanthus angolensis* and *Nauclea* [*Sarcocephalus*] *diderrichii* markedly high, susceptibility. Members of the Moraceae and Myristicaceae seemed in general highly susceptible.

5274. **[Chemical protection of logs against attack by ambrosia beetles.]** *Rep. W. Afr. Timb. Borer Res. Unit 1955/58*, 1959 (11–2, 30–5).

Studies in Ghana and Nigeria on insecticides based on 13 active principles showed γBHC to be the most effective and much superior to aldrin, dieldrin and endrin, the other insecticides (including DDT and creosote) proving unsatisfactory. γBHC (0·75% concentration) gave over 90% protection for 14 weeks; best results were obtained when logs were barked before treatment and the insecticide was applied at 1 gal./100 sq. ft. of log surface or to run-off. For road and rail haulage, water emulsions were highly effective on barked logs, and oil solutions were not significantly better; for floating, however, oil solutions were effective on barked logs and water solutions ineffective. Resin or grease formulations were no more effective or persistent than oil solutions. Unbarked logs treated with fuel oil were more attractive to the beetles than untreated logs.

5275. BECKER, W. B. **Further tests with BHC emulsion sprays to keep boring insects out of Pine logs in Massachusetts.** *J. econ. Ent.* 52 (1), 1959 (173–4). 1 ref.

[Cf. *F.A.* 16 No. 4714.] These tests included *Pinus rigida*. One spring spraying with the 0·4% emulsion gave 97–100% protection against all wood borers and 99–100% against bark and cambium pests throughout the summer, except for the bark weevil *Pissodes approximatus* (53%).

5276. TUOVINEN, A. Kuorellisten havutukkien hyönteispilaantuminen ja sen ehkäisy. **[Insect damage to unbarked softwoods and its prevention.]** *Julk., Metsäteho, Helsinki* No. 42, 1959. pp. 45. 8 refs. [Fi.fi.e.*e*.]

Insect damage to unbarked softwood logs occurs widely in Finland, and is especially heavy in spring in logs stored on land. Damage to Pine logs is chiefly by *Blastophagus minor* causing blue stain and to Spruce by *Trypodendron lineatum*. Abundance of both species is related to the quantity of unbarked tops and to the stacks of unbarked fuelwood and pulpwood available during the summer for breeding. Logs stored on ice and floated either loose or in bundles, are comparatively little damaged during spring, but damage by the insect species already mentioned and by *Ips acuminatus*, *Monochamus* spp. and a variety of Scolytidae increases during middle or late summer. In tests with insecticides, *B. minor* was best, though not completely, controlled. Best results were obtained with one Finnish and one Swiss water-soluble DDT preparation and a Swedish γ-BHC preparation soluble in kerosene. The cost of protecting logs (*a*) stacked on skids on land and (*b*) in bundles, using the Finnish DDT preparation and a Fontan power sprayer, was, respectively, ca. 7 and ca. 2 Finmarks per log. *From author's summary.*

5277. KINGHORN, J. M., and CHAPMAN, J. A. **The effect of Douglas-Fir log age on attack by the ambrosia beetle *Trypodendron lineatum* (Oliv.).** *Proceedings, Entomological Society of British Columbia, Vancouver* 54, 1957 (46–9). 8 refs. I.I.E.

To elucidate the preference of *T. lineatum*, which flies in the first warm days of spring, for autumn- and winter-felled trees over those freshly felled, blocks sawn from a February-felled Douglas Fir were submitted, for periods of 0–12 weeks, to 'ageing' at 72° F. Before ageing, some had the ends waxed (*a*), some not (*b*), and some had 2 hours' autoclaving (*c*). After ageing all were stored at 0° F. until they could be exposed to attack in a forest clearing in mid-May. All (*c*) logs, including those not aged, showed greatly reduced attack densities. In the (*a*) and (*b*) blocks, density of attack decreased with increased ageing. It is suggested that both ageing and autoclaving affected the formation of some attractant, and it is also possible that starch reserves in unautoclaved blocks were depleted by continued cellular activity, so reducing attractiveness.

5278. ***Ernobius mollis.*** *Rep. For. Res. Inst. N.Z. For. Serv. 1957/58*, 1958 (24–5).

Investigation of control methods for *E. mollis* showed that the use of insecticides in the anti-sapstain bath is unlikely to prove economically practicable. Timber protected during seasoning and then pressure-treated by one of 3 selected methods, was not subsequently infested, but timber exposed to infestation and then treated by the same methods, contained a small % of live larvae in the bark ⩾ 1 month after treatment. It has been confirmed that survivors can complete their development in the bark and are able to emerge through wood properly treated with stomach poisons.

5279. WRIGHT, C. G. **The influence of two insecticides on the emergence of *Lyctus planicollis* Le C.** *J. econ. Ent.* 52 (2), 1959 (357–8). 1 ref.

Soaking of Red Oak half-round and split billets for 2 hours in 2% chlordane emulsion or 0·5% dieldrin emulsion gave complete control of populations. Laboratory technique (by weighing billets) for evaluating insecticides against powder-post beetles is discussed.

5280. **Old house borer [*Hylotrupes bajulus*].** *Rep. Ntheast. For. Exp. Sta. 1958*, 1959 (39).

Basement timbers in 14 heavily infested houses were sprayed with oil (ultrasene) solutions of 0·25% and 0·5% dieldrin, 0·5% lindane, 2% chlordane and 5% DDT. All the solutions tested gave complete control in 4–8 weeks.

5281. BECKER, P. ***Bostrychopsis parallela* Lesne (Col., Bostrychidae) imported in Bamboo.** *Ent. mon. Mag.* 95 (1138), 1959 (68).

Live beetles of *B. parallela* are reported, for the first time in Great Britain, in a consignment of canes imported from Tonkin, Vietnam.

5282. HICKIN, N. E. **Some involuntary immigrants. A series of unusual wood-boring beetles.** *Timb. Technol.* 67 (2239), 1959 (213).

Illustrates and briefly describes *Pseudococeocephalus picipes* and *Cylindrus niger*, both found in a Lancashire timberyard in 1948.

5283. SPENCER, G. J. **The wharf borer in a Vancouver branch library.** *Proceedings, Entomological Society of British Columbia, Vancouver* 54, 1957 (44–5). 1 ref. I.I.E.

A note describing the habits of *Nacerdes melanura* found breeding in wet timbers from a badly ventilated air-space under a floor in Vancouver. It is considered an indicator rather than a cause of deterioration in timber.

5284. BOOCOCK, D. **The behaviour and treatment of *Sirex* woodwasps.** *Timb. Technol.* 67 (2237), 1959 (129–31).

Describes the life cycle of *S. gigas* and *S. cyaneus* in the U.K., and *S. noctilio* in New Zealand, the damage caused, and methods of treatment (heat sterilization, fumigation, pressure impregnation, etc.).

845.3. Termites

5285. EBELING, W., and WAGNER, R. E. **Rapid desiccation of drywood termites with inert dusts and other substances.** *J. econ. Ent.* 52 (2), 1959 (190–207). 40 refs.

[Cf. *F.A.* 18 No. 2237.] Reports the efficacy of 23 substances used alone, and in various combinations, with and without toxic insecticides, and in various air humidities (43 treatments) against *Kalotermes minor*. Sorptive dusts adsorb or disrupt the lipoid protective layer (wax) covering the epicuticle, the insect needing only to crawl about on a thin film of the dust. Death, by desiccation, follows the loss of ca. 30% of the body weight of water and it is more rapid with the more effective dusts than with some toxic insecticides possessing a faster knock-down action. Cockroaches, fleas, bedbugs, bees, ants, vinegar flies, mosquitoes, house flies, thrips, ticks and mites succumbed similarly. These dusts were more effective than abrasive types, particularly some silica aerogels. Certain water-soluble fluorides have been incorporated as monomolecular layers in the particles of these dusts. They act as contact poisons after the wax has been adsorbed or disrupted, thereby greatly increasing the effect of the dust at low humidities but with the particular advantage that the effect increases with increasing humidity, so enhancing the versatility of the aerogels. The fluorides also increase the adherence of the particles to a dusted surface through the positive charge they impart [cf. *F.A.* 19 No. 528]. Desiccation by surface-active solutes in petroleum (subsequently removed), and by other substances, e.g. NaF and parathion, is also discussed.

5286. WAGNER, R. E., and EBELING, W. **Lethality of inert dust materials to *Kalotermes minor* Hagen and their role as preventives in structural pest control.** *J. econ. Ent.* 52 (2), 1959 (208–12).

Describes a pilot test, eliminating from 162 insecticide diluents and other fine inert substances, those that did not give 100% kill in 5 hours or less. The more likely of the remainder were then blown over blocks of wood in a wind tunnel at 1400 ft./sec. (found to be the best speed) and termites confined with the blocks. The order of efficacy of the 4 outstanding groups was silica gels, aerogels or precipitates > montmorillonite clays = attapulgite clays > diatomites. Blocks placed in attics in positions of various accessibility from the point of dust-discharge, showed that the lighter materials were more evenly distributed, their superiority for killing termites increasing with their distance from the discharge point.

846. Steaming

5287. KOHLER, H. Die Rotbuche—praktische Probleme der Pflege und Bearbeitung. **[Practical problems of treating and working Beech wood.]** *Holz-Zbl.* 85 (67), 1959 (867–70). 26 refs. [G.]

Includes, in addition to a discussion of growth tensions, additional tensions due to storage, steaming or seasoning, tylose formation, etc., a brief report on the author's work on irreversible changes caused by steaming, with some data on the reduction in weight, in strength properties and in hygroscopicity, effects on colour, and anatomical deformation.

5288. PERKITNY, T., ŁAWNICZAK, M., and MARCINIAK, H. Über den Einfluss des Dämpfens auf den Quellungsdruck des Holzes. **[The influence of steaming on the swelling pressure of wood.]** *Holz Roh- u. Werkstoff* 17 (2), 1959 (54–61). 12 refs. [G.g.e.] P.R.

Samples of Beech sapwood 30 × 30 × 20 mm., carefully prepared from pieces that had been steamed for 0, 1, 2, or 3 hours, were used in investigations on water absorption, free swelling, and swelling pressure. Results are tabulated and graphed. Although the final max. values for free swelling were not lowered, but were rather slightly increased, by steaming, a marked and lasting reduction in the max. swelling pressure of the steamed samples was recorded.

847. Drying (Seasoning)

See also Nos. 5211, 5217, 5312.

5289. KOZLIK, C. J. **Bibliography of special seasoning methods.** Forest Products Research Center, Corvallis, Ore. 1959. pp. 34. 281 refs.

Presents 281 selected references, some annotated, chiefly from American, English, German, French and Russian sources, under the following heads: General; Accelerated air drying; Boiling in oil; Centrifugal drying; Chemical seasoning; H.F. dielectric heating; High-temperature drying; Infrared radiation; Solvent seasoning; Vacuum drying; Vapour drying; Vapour drying and preservative treatment; Whirl driers; and Unclassified methods.

5290. CLARK, W. P., and HEADLEE, T. M. **Roof your lumber and increase your profits.** *For. Prod. J.* 8 (12), 1958 (19*A*–21*A*).

An air-seasoning study on Red Oak in wet and dry seasons in S. Illinois indicated that by preventing or reducing degrade (particularly checking) and promoting uniform drying, roofs soon justify themselves economically.

5291. WHITMORE, R. A. **Air-drying lumber to increase mill profits.** *Tech. Pap. Cent. St. For. Exp. Sta.* No. 158, 1958. pp. 9.

Results of a study at a small sawmill in Ohio on the effect of air-drying on the grade volume and value of 13,090 bd. ft. of Red and White Oak board 8/4 (2 in.) and 4/4 (1 in.) thick, showed that air drying increased the value of the lumber by $261.78. Data are tabulated.

5292. DAŠKOVSKIJ, A. F., and DLIN, F. S. Skorostnaja suška bukovyh zagotovok cikličnym sposobom. **[Quick drying of Beech boards by a cyclic method.]** *Derev. Prom.* 7 (11), 1958 (3–4). [Russ.] P.R.

Describes investigations on the rapid drying of Beech boards 25–50 mm. thick by a 2-phase (or 2-cycle) process: (1) air-seasoned at low, or kiln-dried at medium temperatures to avoid cracks and deformation, and (2) at temperatures > 100°C. Details of the various drying regimes in relation to board thickness and initial m.c. are presented in graphs. [Cf. *F.A.* 20 No. 1185.]

5293. SALLENAVE, P. Le séchage naturel des bois en pays tropicaux. **[Air drying of timber in the tropics.]** *Bois For. Trop.* No. 63, 1959 (49–56). [F.e.span.]

In the humid tropics, at Douala and Eseka (Cameroons), *Pycnanthus angolensis* planks 3 cm. thick dried in 30 days, and *Lophira procera* (2.7 cm.) in 50. At Libreville, Gabon, *Aucoumea klaineana* and *Staudtia gabonensis*, and at Ziguinchor (Senegal) *Khaya senegalensis* and *Chlorophora regia* planks have all been dried in 2 to 3 months, the last two to ca. 10% m.c. Directions for stacking and testing are given.

5294. KROTOV, L. I. O razmerah špacij pri atmosfernoj suške pilomaterialov iz sibirskoj listvennicy. **[Dimensions of horizontal spaces between boards in the air seasoning of *Larix sibirica* timber.]** *Derev. Prom.* 5 (9), 1956 (18). [Russ.] P.R.

Results of practical experience in the Krasnoyarsk region show the inadequacy of Soviet Standard GOST 3808–47 as a guide to the proper horizontal spacing between boards for air seasoning of *L. sibirica*. Measurements of moisture gradients and evaluation of degrade after the seasoning of 25

× 160-mm. boards showed that the % passing into a lower grade after seasoning was 4·45% and 7·17% when the mean spacings were respectively 0·37 and 0·59 of the board width. Although closer spacing means longer seasoning, this disadvantage is offset by a higher utilization %. The author presents in a table the recommended spacings, in terms of board width, for Larch 22–25 and 45–50 mm. thick and for the months April to September.

5295. GANESAN, K. **Electrical determination of the moisture content of 6/4 Maple lumber during kiln seasoning.** *Ceylon For.* (*n.s.*) 3 (1), 1957 (73–81).

The main experiment dealt with the Kil-Mo-Trol, a remote-control electrical moisture meter which, at its present stage of development, is concluded to be unsuitable for the control of a kiln during the drying of green hardwoods. Suitable kiln schedules for Maple are discussed.

5296. **Kiln-drying schedules.** *Leafl. For. Prod. Res., Lond.* No. 42 (rev.) 1959. pp. 15. Price 1*s*.

[Cf. *F.A.* 18 No. 1083.] Includes a few new species and changes in schedule.

5297. SIIMES, F. E. Havaintoja keinokuivauksen viimeaikaisesta kehityksestä sahoilla ja vaneritehtailla. **[Recent developments in kiln drying at Finnish sawmills and plywood factories.]** *Pap. ja Puu* 41 (4), 1959 (223–32). [Fi.fi.e.] P.R.

Describes factory and laboratory studies on the passage of air through kiln loads and the influence of the thickness of stickers on drying speed and uniformity. Describes a fully automatic universal drying machine and technical characteristics of 10 kilns for sawn timber, and gives an example of drying veneer. *From author's summary.*

5298. **Timber seasoning.** *Rep. For. Res. Inst. N.Z. For. Serv. 1957/58*, 1958 (31).

Investigation of the checking of intergrown knots during kiln drying of *Pinus radiata* indicated that this defect can be reduced by drying under mild conditions to a final m.c. of 16–18%, but that in timber dried to 12–14% m.c., even under mild conditions, the majority of intergrown knots check. Study of variation between individual knots revealed that those with higher resin content are less prone to check.

5299. KEMP, A. E. **Factors associated with the development of collapse in Aspen during kiln drying.** *For. Prod. J.* 9 (3), 1959 (124–30). 24 refs.

With the help of an instrument allowing the scanning of board surfaces in the kiln, the effect on collapse of freshly sawn Aspen [*Populus tremuloides*] boards in relation to drying temperatures (140°–170° F.) and relative humidities (40–70%) was investigated. The time before collapse developed varied from 44 to 149 minutes, according to the severity of the schedule, linearly with temperature and in sigmoid curve with r.h. It developed while the samples were above fibre saturation point, generally in the wetwood zone, and started in the early-wood part of the annual ring. It was frequently associated with a yellowish infiltration product.

5300. ELLWOOD, E. L. **Drying stress patterns in California Black Oak [*Quercus kelloggii*].** *Calif. For. & For. Prod. Calif. For. Prod. Lab.* No. 9, 1959. pp. 6. 6 refs.

Drying stresses (measured by the elastic recoveries of strips cut periodically from a test board during the 20-day kiln run) followed patterns similar to those of other hardwoods [cf. *F.A.* 16 No. 4721; 17 No. 975]. Surface checking was correlated with surface tensile strains developing early in the run. Conclusions for drying schedules are discussed. [Cf. *F.A.* 10 No. 3877.]

5301. **Solvent seasoning shows promise for drying Redwood, Tanoak.** *Calif. For. & For. Prod. Calif. For. Prod. Lab.* No. 10, 1959 [1].

Preliminary tests have been made on the application of solvent seasoning to the problem of drying Redwood [*Sequoia sempervirens*]. In this process, moisture is extracted by passing a hot polar solvent, such as acetone, over the lumber at atmospheric pressure. Initial tests suggest that 4/4 [1-inch] sinker stock can be dried in 6–7 days without excessive degrade. The seasoned lumber is initially lighter in colour than conventionally seasoned lumber, but soon assumes the characteristic Redwood colour on exposure to air. A few preliminary tests on Tanoak [*Lithocarpus densiflorus*] showed similar promise: fresh, green 1-in. sapwood was dried to $< 10\%$ m.c. in 36 hours with relative freedom from seasoning defects.

848. Timberyard Practice. Handling and Storage of Timber

See also Nos. 4618, 4621, 4653, 4696, 5211, 5233, 5258, 5329.

5302. NGOK, W. C., BURGESS, H. J., and JACKSON, W. F. **A comparison of end coatings on Keruing [*Dipterocarpus grandiflorus*] planks.** *Malay. Forester* 22 (2), 1959 (158–67).

Describes in detail the lay-out of experiments to test 4 different end-coatings to prevent end splitting in sawn timber. With certain suggested modifications, the type of experiment seems very suitable for further work on end coatings.

5303. MCMILLEN, J. M. **Prevention of end checks and decay in logs.** *Aust. Timb. J.* 25 (1), 1959 (13 . . . 23, 89–90, 93).

Covers general considerations and requirements, and (*a*) hot coatings (paraffin, rosin and lampblack, pitch and asphalt, and proprietary petroleum and coal-tar derivatives), (*b*) cold coatings (pigments and oil pastes, filled varnishes, wax emulsions and hygroscopic pastes), and methods of application by hand and power-driven roller.

5304. BOYE, C., and EGUND, K. F. **Tests on the reduction of check formation in the end surfaces of Beech veneer logs.** *Transl. Commonw. sci. industr. Res. Organ. Aust.* No. 3626, 1957. pp. 17 + 6 photos, 2 dgms. 5 refs. Transl. by J. Hardy from *Træindustrien* 7 (5), 1957 (67–74). [See *F.A.* 18 No. 4729.] Limited distribution.

85. Grading of Wood and Wood Products

851. Timber Quality in General

See also Nos. 4354, 4516, 5013, 5168.

5305. MITCHELL, H. L., and WHEELER, P. R. **Wood quality of Mississippi's Pine resources.** *Rep. U.S. For. Prod. Lab., Madison* No. 2143, 1959. pp. 11 + 8 gphs., 1 tbl. 7 refs.

Slash, Longleaf, Shortleaf, Loblolly and Spruce Pines were subjected to *in situ* sampling, the main objects being: (1) to obtain better information on intrinsic wood quality of Mississippi Pine resources; (2) to seek out living trees of superior wood quality, form and growth rate for breeding studies and nursery requirements; and (3) to study the effects of environmental factors on wood quality and to apply this information to the practical growing of higher-value trees. [Cf. *F.A.* 20 No. 938.]

852. Detection, Recognition and Assessment of Injuries and Defects

See also Nos. 4630, 4778, 4952, 5102, 5131, 5298–5300, 5303–4.

5306. DAY, W. R. **Observations on Eucalypts in Cyprus. I. The character of gum veins and anatomical indications for their origin.** *Emp. For. Rev.* 38 (1), 1959 (35–44). 11 refs.

It is shown that in the species of Eucalypt examined, gum zones may form in the bark, but not then in the wood—as in *E. gomphocephala*, *E. hemiphloia* and *E. occidentalis*; or in the wood, but not then in the bark—as in *E. rostrata* and *E. maculata*. It is suggested that this is a systematic distinction typical for the groups of Eucalypts represented—the Boxes and the Gums.

It is demonstrated that gum-zone formation follows after collapse of tissue in the meristematic zone. This is held to be caused by water supply deficiency. The movement of the zone of collapse, developed as a gum zone, into the phloem, or into the xylem, is determined by the position in which meristematic activity is resumed; i.e. on the inner side of the tissue affected by collapse in the Boxes and on the outer side in the Gums. The tissues that surround the pipes of collapse remain parenchymatous.

Comparison is made with similar phenomena that occur in conifers and seem to be related principally to water deficiency.

A short reference is made to the longhorn borer, *Phoracantha semipunctata*, in connexion with gum-zone formation in *E. gomphocephala*. *From author's summary.*

5307. **Compression wood in pulpwood. Revision of Tentative Standard Method T20 m-55.** *Tappi* 42 (2), 1959 (144*A*-145*A*). 5 refs. P.R.

[Cf. *F.A.* 16 No. 3551.] The major change in the revision is the inclusion of the alternative method of measuring areas by weighing corresponding areas outlined on paper.

5308. LASSEN, L. E. **Tension wood in Eastern Cottonwood, its effect on density, toughness, and compression.** *For. Prod. J.* 9 (3), 1959 (116–20). 12 refs.

Describes tests with matched samples from the upper and lower sides of 5 *Populus deltoides* stems having leans of $\geqslant 10\%$. The upper, tension-wood side was generally heavier, tougher, and slightly more elastic, but weaker in compression ||. Toughness was apparently more related to position than to sp. gr., being greatest near the bark (i.e. where there was the greatest amount of gelatinous fibres). [Cf. *F.A.* 19 No. 4966.]

5309. B., K. Technologische Schäden am Holz durch Blitzschlag. **[Damage to wood by lightning.]** *Holz-Zbl.* 85 (15), 1959 (177). 1 ref. [G.]

Includes a brief discussion of observations on the appearance of wood (chiefly Spruce) damaged by lightning, adverse effects on strength properties and resistance to pests and fungi, etc. It is recommended that trees injured by lightning indirectly (i.e. those round a struck tree) should be felled as soon as possible, preferably before the next growing season.

5310. BUGLAJ, B. M. **A new testing instrument for wood surfaces.** *Transl. Commonw. sci. industr. Res. Organ. Aust.* No. 3661, 1958. pp. 7 + 2 dgms. Transl. by M. Slade from *Holzindustrie, Leipzig* 6 (10), 1953 (295–9). [See *F.A.* 17 No. 4547.] Limited distribution.

5311. KIKATA, Y. **[Studies on surface roughness of wood. I. A simple apparatus for determining surface roughness and its applicable conditions.]** *J. Jap. Wood Res Soc.* 4 (6), 1958 (216–9). 1 ref. [Jap.*e.e.*] P.R.

Discusses various problems arising from the use of the ball-point dial-gauge tracing apparatus described [cf. *F.A.* 19 No. 4968]. Profile readings are inaccurate if the tracing point (ball) radius is too large, while continuous readings are disturbed by insignificant cavities if the radius is too small. Two formulae are derived for solving these problems, by previously determining the error in each case, and tables are presented showing the contact pressures and point radii required for *Cercidiphyllum japonicum*, *Fraxinus mandshurica* var. *japonica*, *Cryptomeria japonica*, *Chamaecyparis obtusa*, etc.

5312. **Redwood sticker stain related to water-soluble extractives.** *Calif. For. & For. Prod. Calif. For. Prod. Lab.* No. 10, 1959 [1–2].

Sticker stain and other surface discolorations of Redwood [*Sequoia sempervirens*] lumber have been shown to result from deposition of extractives on the surface of the lumber during normal drying. Evidence has also been found suggesting that the length of green log storage may play an important part in subsequent staining.

853. Grading of Wood in the Rough

See also Nos. 4622, 5213.

5313. HERRICK, A. M. **Grading and measuring Hickory trees, logs, and products.** *Hickory Task Force Rep. Stheast. For. Exp. Sta.* No. 7, 1958. pp. 18. 12 refs.

Includes volume tables for Hickories from various regions of the USA, a table of yields of Hickory handle bolts, grade recovery figures based on trial runs, quality indexes, trade specifications for handle blocks, skis, poles and bark, etc.

5314. PATON, R. R. **Ohio standard saw log grades.** *J. For.* 57 (5), 1959 (370).

The new system of grades is similar to the Purdue log grades, but with modifications to make it more suitable to Ohio conditions. The grade specifications are tabulated.

854. Grading of Converted Timber

See also Nos. 5081, 5313.

5315. **Grading of sawn British hardwoods.** *Leafl. For. Prod. Res., Lond.* No. 52, 1958 (1959). pp. 8.

Presents recommended rules, prepared after consultations with a committee representing both producers and consumers, in which permissible defects (illustrated) are defined for each grade.

86. Pulp Industries. Composite Materials made Wholly or Partly of Woody Matter. Chemical Utilization of Wood

861. Pulp and Paper Manufacture. Textile and Other Cellulose Derivatives

See also Nos. 5062, 5145, 5170, 5411.

5316. **Map showing pulp and paper industry of Canada.** Forestry Branch, Ottawa. 1958.

Scale 1 inch: 100 miles (approx.). Shows the location of mills and lists companies, with their addresses and products.

5317. PEEL, J. D. **Pulp and paper manufacture in Malaya. Part I. The paper and fibreboard trade in the Federation of Malaya and Singapore. Part II. A survey of raw materials available in Malaya for the manufacture of pulp.** *Malay. Forester* 22 (1), 1959 (62–89).

5318. PIESSLINGER-SCHWEIGER, W. Rapport au gouvernement du Viet-Nam sur la possibilité de développer une industrie papetière nationale. **[Report to the Viet-Nam government on the possibility of developing a national paper industry.]** Expanded Technical Assistance Program, FAO, Rome. *FAO Report* No. 897, 1959. pp. 29 + 50 + many gphs., dgms., maps & photos. [F.] Limited distribution.

Discusses the available resources (raw material, water, power etc.) and presents short- and long-term programmes. The appendices include data on the structure (with photomicrographs) and pulping properties of *Pinus khasya*, Bang-Lang [*Lagerstroemia* sp.?] and Bamboo [unspecified].

5319. KOROLEFF, A. **Report to the Government of Indonesia on pulpwood logging.** Expanded Technical Assistance Program, FAO, Rome. *FAO Report* No. 1020, 1959. pp. 12 + [2] + 4 tbls., 1 map. Limited distribution.

A study in connexion with the planned erection of a paper mill [cf. *F.A.* 18 No. 2043] with chief reference to pulpwood plantations in Central Java, comprising ca. 10,000 ha. of *Pinus merkusii* and 3000 ha. of *Agathis loranthifolia*.

5320. DADSWELL, H. E., and WARDROP, A. B. **Growing trees with wood properties desirable for paper manufacture.** *APPITA, Melbourne* 12 (4), 1959 (129–36). 26 refs.

From the evidence so far available, it seems that a higher than average fibre length in a species, a high proportion of thin-walled cells, an amount of late wood between 15 and 50%, and a low extractive and high cellulose content are the desiderata in wood for pulping. Some, and perhaps all, of these features may be genetically controlled, and selective breeding should be able to develop trees with the features required. Means of assessing the wood qualities of trees that might be selected for breeding purposes are described. *From authors' summary.*

5321. PHILLIPS, F. H., and WATSON, A. J. **Pulping studies on New Guinea woods. Pulping properties of *Araucaria* veneer waste and plantation thinnings.** *APPITA, Melbourne* 12 (5), 1959 (156–66). 8 refs.

Sulphate pulps from virgin-growth *A. klinkii* veneer-bolt cores, rejected veneer, and veneer trimmings, proved comparable with pulps prepared from timber. Sulphate pulping of 7-year-old plantation thinnings gave satisfactory yields of pulp with slightly lower strength properties than those of pulps from mature wood. A normal proportion of small knots caused no appreciable pulping difficulties or lower strengths. Data on the pulps are tabulated.

5322. SEELKOPF, C., *et al.* Investigación acerca de la posibilidad de obtener pulpa y papel a partir de algunas plantas venezolanas. **[The possibility of obtaining pulp and paper from some Venezuelan plants.]** *Rev. for. venez.* 1 (1), 1958 (37–144). 33 refs. [Span.span.e.g.]

The morphology and anatomy of *Guadua latifolia* (a Bamboo), *Cecropia* spp., *Pourouma guianensis*, *Bursera simaruba*, *Solanum* sp., and *Ochroma lagopus* were investigated. Apart from *G. latifolia*, all the species have fibres shorter than those of conifers, but with thin walls and wide lumina. Samples of sulphate pulps were made at 150° C., purified and bleached, and the properties of the papers were tested. The papers were found to be comparable to those made from coniferous pulps. The possibilities of harvesting these species in sufficient quantities from the virgin forest or of creating plantations are discussed.

5323. MOONEY, H. F. **A report on the Bamboo forests of Wallega province [Abyssinia] with a view to their possible utilization for paper pulp.** [British Middle East Development Division] Addis Ababa. 1959. pp. 8. Limited distribution.

A description of ca. 2200 sq. miles of forest o *Oxytenanthera abyssinica*. Assuming a yield of 5 tons air-dry culms per acre and a 4-year cutting cycle [cf. *F.A.* 18 No. 1123] 24,000–30,000 acres would provide the 30,000 tons required for 10,000 tons of paper. With water also plentiful, the project is recommended for serious exploration. [Cf. *F.A.* 17 No. 2203.]

5324. Bhat, R. V., and Jaspal, N. S. **Chemical pulps and writing and printing papers from Kana grass (*Saccharum munja* Roxb.).** *Indian For.* 85 (4), 1959 (241–8 + specimen sheet). 2 refs.

Describes successful laboratory experiments in soda pulping.

5325. Chittenden, A. E., and Palmer, E. R. **Pulping trials on *Pinus caribaea* wood from British Honduras.** *Trop. Sci., Lond.* 1 (1), 1959 (22–40).

Gives results of a chemical analysis of the air-dry chips, microscopic analysis of the fibres, and pulping trials of 2 old logs 48 and 52 in. long and 6 fresh discs (each weighing 490 g.). The findings were not wholly satisfactory, because the logs providing the bulk of the material were very dry and no details of age etc. were available, but *P. caribaea* fibres appeared to be brittle and easily broken by mild physical treatment, the pulp had a high tear, and the age of the timber and other factors, e.g. rate of growth and environment, tended to influence fibre characteristics and therefore pulp quality. More work, however, is needed.

5326. Bruun, H. H., and Slungaard, S. **Investigation of porous wood as pulp raw material. 3. Fibre dimensions of several N.W. European wood species.** *Pap. ja Puu* 41 (2), 1959 (31–4). 8 refs. [E.e.fi.] P.R.

[Cf. *F.A.* 19 No. 3392.] Presents the results of measurements of lengths and widths of tracheids of Spruce and Pine and of libriform fibres and vessel segments of *Betula pubescens*, *B. verrucosa* and *B. tortuosa*, *Alnus glutinosa* and *A. incana*, Aspen and Oak. No damaged fibres were included in the measurements. The mean length of conifer tracheids was ca. 2·8 mm. In the hardwoods, libriform fibres of the Birch species exceeded 1 mm. in mean length, those of Oak, Aspen and *A. glutinosa* were ca. 0·9 mm. and those of *A. incana* 0·83 mm. Vessel segments ranged from 0·6 to 0·8 mm. The mean length of libriform fibres of *B. pubescens* was 1·21 and of *B. verrucosa* only 1·07 mm., a noteworthy difference when considering their pulping properties.

5327. Cowan, W. F. **The effect of crushing as a wood pretreatment.** *Tappi* 42 (2), 1959 (152–8). 12 refs. P.R.

[Cf. *F.A.* 20 No. 1204.] Advances a possible explanation of the detailed mechanism by which the fibres are weakened following the axial compression and subsequent kraft pulping of 2 × 2 × ½-in. Spruce wood blocks and discusses in detail the strength data collected and their implications for some fundamental aspects of paper strength tests.

5328. Hyttinen, A., and Schafer, E. R. **The groundwood pulping of Balsam Fir and Jack Pine.** *Rep. U.S. For. Prod. Lab., Madison* No. 2139, 1958. pp. 6 + 1 tbl. 10 refs. P.R.

Briefly reviews previous work, and discusses the experimental groundwood pulping of *Abies balsamea* and *Pinus banksiana*. Groundwood pulp from these two species was of lower strength than that from Spruce, but generally higher than that from Southern Pine. Remoistening of seasoned wood to the m.c. of green wood produced optimum grinding results, and, since Balsam Fir and Jack Pine do not require stone surfaces as sharp as those needed for Spruce, these two species should be ground separately. No pitch difficulties arose with Jack Pine in the grinding experiments.

5329. Browning, B. H., *et al.* **Inactivation of organo-mercurial fungicides in groundwood pulp made from logs stored in salt water, and the possible role of sulphur compounds.** *Nature, Lond.* 183 (4671), 1959 (1346–7). 3 refs.

Experiments have shown that a correlation exists between the efficiency of organo-mercurial fungicides, used for the preservation of moist groundwood, and the concentration of certain S compounds in the logs from which the groundwood is produced. These S compounds are considered to arise from the reduction of inorganic sulphates, absorbed from salt or brackish water during storage, by halophilic strains of *Desulphovibrio desulphuricans.* It has been found that after only 3 months' soaking of logs in sea water, mercurial fungicides are deactivated at once on addition to the resultant pulp.

5330. Nordman, L. S. **Mechano-chemical pulps in paper and board manufacture [with discussion].** *Medd. Industr. CentLab., Helsinki* No. 207, 1958 (35–50). 23 refs. [E.e.] P.R.

An address, with discussion, reviewing two pulping methods recently developed to the commercial stage: (1) the chemigroundwood and (2) 'groundwood from chips' [cold semichemical] and comparing their screen-analysis (Birch and Aspen) and (Spruce and Pine) strength values with those of Spruce groundwood, and their bonding, density and stiffness (Aspen) in corrugated boards with those made from NSSC Birch pulp.

5331. Chesley, K. G. **Strength characteristics of bleached sulphate and NSSC [neutral sulphite semi-chemical] hardwood pulps.** *Tappi* 42 (2), 1959 (130–7). 6 refs. P.R.

Presents data on a comparative laboratory study of two bleached and two unbleached pulps produced from mixed Southern Oaks (*Quercus stellata, Q. falcata* and *Q. alba*) by the kraft and NSSC processes.

5332. Brown, K. J. **Cold soda pulping of Southern Oaks, Sweetgum, and Cottonwood.** *Tappi* 42 (2), 1959 (158–64). 4 refs. P.R.

A mixture of *Quercus nigra* and *Q. phellos* was pulped under various conditions of pressure, time, temperature, and chemical concentration to produce pulps in yields of 82–96%. Batch and continuous cold-soda methods developed at Madison were used, and the pulping characteristics of different woods were determined and compared. Hardwood pulps suitable for printing paper, were made by treating a mixture of Red and White Oaks, Sweetgum and Cottonwood with NaOH solutions at room temperature in a digester for (*a*) 2 hours at atm. pressure, or (*b*) 30 min. at 150 lb./sq. in. Cold soda pulp from *Liquidambar styraciflua* was stronger and darker in colour than Southern Pine groundwood; cold soda pulp from *Populus deltoides* was stronger and lighter in colour than that of *L. styraciflua*. *From author's summary.*

5333. BACZYNSKA, K. **[Evaluation of Willow [*Salix alba* and *S. pyramidalis*] for the pulp industry.]** *Przegląd Papierniczy, Łodz* 14, 1958 (198–201). [Pol.?] From *abstr.* in *Chem. Abstr.* 53 (10), 1958 (9662). P.R.

Willows pulped on laboratory scale by the sulphate process were compared with Pine and Poplar. Results showed that Willows required 4% less alkali than Pine, less steam and shorter cooking time. Their pulp strengths, however, were lower than those of both Pine and Poplar.

5334. DORLAND, R. M., LEASK, R. A., and MCKINNEY, J. W. **Pulp production with sodium bisulphite. II. Hardwoods.** *Pulp Paper Mag. Can.* 60 (2), 1959 (*T*37–*T*49). 6 refs.

[Cf. *F.A.* 19 No. 4983.] Using the Arbiso process, *Populus tremuloides, Betula papyrifera, Betula lutea* + *Ulmus americana*, and Maple, were pulped (*a*) individually, (*b*) in several combinations with each other and with Beech, and (*c*) with softwoods. The results, tabulated in detail, were fully as favourable as with softwoods alone.

5335. MARTH, D. E. **Studies on the lignin fraction of Aspenwood [*Populus tremuloides*] pulps produced by sulphite-bisulphite cooking liquor systems.** *Tappi* 42 (4), 1959 (301–8). 25 refs. P.R.

Aspen chips were pulped by sulphite-bisulphite cooking liquors of initial pH 4·5, 7·2, and 9·0, for varying periods under otherwise constant cooking conditions. The relationship between pulp yield, lignin content, S content, aldehyde yield on $C_6H_5NO_2$ oxidation of pulp and liquor, and position of sulphonated and unsulphonated lignin residues in the partly cooked chips were compared for the various pH levels and pulping times. *From author's summary.*

5336. WARD, K., JR., and MURRAY, M. L. **Alkaline extraction of Spruce pulps.** *Tappi* 42 (1), 1959 (17–20). 29 refs. P.R.

Compares the efficacy of NaOH and KOH used with and without the addition of corresponding borates as media for removing mannose and xylose residues from holocelluloses of Spruce wood and Spruce pulp. Determination of the constituent sugars before and after extraction shows that NaOH removes the non-glucoses more thoroughly than any of the other extractants; that there is generally little difference in the efficacy of the borates; and that extraction with KOH makes subsequent extraction with alkali borate less effective.

5337. RAPSON, W. H., and MORBEY, G. K. **Highly purified cellulose from wood.** *Tappi* 42 (2), 1959 (125–30). 22 refs. P.R.

In an attempt to prepare a cellulose free from non-glucose sugar units while still retaining its fibrous characteristics, a Spruce pulp, 'Acetacell', was extracted in separate batches with increasing concentrations of Na, Li, and benzyltrimethylammonium hydroxides, at 5% consistency, for 4 hours at 25 and 95° C. Accurate results for xylan and mannan content could not be obtained by the ordinary chromatographic method, but the use of a sensitive spray reagent enabled determinations to be made of the mannose and xylose in the range 0·05–1·5% of the glucose by visual comparison with known sugar solutions of similar composition to the pulp hydrolysate. The results obtained indicate that mannan and xylan units do not form part of the cellulose molecule, though their separation from the cellulose is made difficult by their chemical similarity to it. However, by the extractive techniques developed, wood pulp can be purified to leave a fibrous residue of high molecular weight that is essentially pure cellulose containing only anhydroglucose units. [Cf. *F.A.* 19 No. 965.]

862. Composite Materials made Wholly or Partly of Woody Matter

See also Nos. 5192, 5228, 5317, 5366, 5405.

5338. **Fibreboard and particle board. Volumes 1–6.** FAO, Rome. 1958. Each paper separately paginated. Many refs. P.R.

A collection of the technical papers (all in English and many with summaries) submitted to the International Consultation on Insulation Board, Hardboard and Particle Board, Geneva, 1957. Vol. 1 contains 20 papers on world consumption, production and trade, covering Europe, Israel, N. and S. America, S. Africa, Japan and Oceania; Vol. 2, 20 papers on raw materials, concerned mostly with experiences with various species and mixtures, the influence of bark, and the possibility of utilizing materials other than wood, e.g. flax; Vols. 3 and 4, 46 papers on processes and equipment; Vol. 5, 13 papers on economic aspects for production and marketing; Vol. 6, 4 papers on research needs to enhance future development; with an appendix of 4 papers on forestry and the insulation corkboard industry in Portugal.

5339. LYNAM, F. C. **Chipboard materials and their treatment. I-IV.** *Timb. & Plyw.* 115 (2998), 1958 (857); 116 (2999–3001), 1959 (21–3; 57, 59; 89). P.R.

Report in 4 parts of a lecture given on 11 Dec. 1958, to the Institute of Wood Science, London. Part I discusses the factors affecting chipboard quality, indicating that the constituent materials are possibly of less significance than the method of treating them. Part II expands on this, outlining the effect on quality of the machinery used for converting the timber, e.g. breaking or crushing machinery produced a lower-quality board than cutting machinery yielding long slender chips of uniform, predetermined size, an important factor in obtaining a graded densification of the board throughout its thickness. Part III covers glue treatments, stressing the importance of even distribution rather than excessive application of glues, e.g. urea-formaldehyde which, in large quantities, exhibits the phenomenon of progressive shrinkage over a period of 2–3 years, whereas by using it in smaller quantity to obtain a 'spot-welding' effect, the greater flexural strength of the loose, lattice-type structure of the chips is more fully utilized. Part IV describes the various factors influencing the properties of the finished product, emphasizing the extent to which its strength, dimensional stability, surface texture, acoustic properties and even any tendency to blistering, are dependent on the density of the material.

5340. MARRA, G. G. **Particle boards, their classification and composition**. *For. Prod. J.* 8 (12), 1958 (11*A*–16*A*).

The chief distinctions discussed are number of layers (one-layer flat-pressed or extruded, and 2- or 3-layer flat-pressed) and the wood elements used, i.e. particles produced by disk grinders or hammer mills from chips or shavings (including fibrous fines), and flakes produced by knife cutters and having oriented grain, the trend being towards flakes and multi-layer boards. Some special boards and processes are described.

5341. PRASAD, B. N. **Chip boards from Indian timbers**. *Research & Industry, New Delhi* 2 (11), 1957 (293–7). 3 refs. P.O.

Presents tabulated results of preliminary tests on physical and mechanical properties of boards from materials including *Cryptomeria japonica*, *Tectona grandis*, *Cedrela toona*, *Cinchona* sp., *Acacia mollissima*, *Parishia insignis*, *Abies pindrow*, *Acer* sp., *Betula* sp., and *Dendrocalamus strictus*. The boards compared favourably with imported ones. Average cost was ca. *Rs*.350/ton.

5342. FICKLER, H. H., and LUNDMARK, L. E. Poizkusna proizvodnja ivernih plošč iz neobeljenega lesa. **[Experimental production of chipboards from unbarked wood.]** *Les, Ljubljana* 10 (5), 1958 (64–6). [Sloven.e.g.]

In experiments at Brunswick (W. Germany), in (1) chipboard made from unbarked wood the bending strength was higher, and the tensile strength ⊥ and the screw-holding power were lower, than in (2) boards from barked wood. Swelling and water absorption were greater in (1) than in (2).

5343. MARIAN, J. E., and WISSING, A. **The utilization of bark. Part 4. Fibres from Spruce bark in wet process hardboard**. *Svensk PappTidn.* 62 (7), 1959 (225–9). 35 refs. [E.e.sw.g.] P.R.

[Cf. *F.A.* 20. 5370.] Reviews literature, mostly Scandinavian and N. American, on the use of unbarked raw material from 13 softwoods and 3 hardwoods, and presents the results of studies on hardboards from furnishes of Spruce wood with varying proportions of bark from logs transported by land and defibrated in conditions milder than those normally used for pulp chips. For unsized hardboards, given no heat treatment other than hot pressing, an admixture of up to 40% of the bark fibres with the normal wood furnish gave values of modulus of rupture in bending, water absorption and thickness swelling similar to those of hardboard made of wood only. When the boards were stored for 4 hours at 160° C. after pressing, only 30% bark could be added to the furnish without affecting board properties.

5344. WATANABE, H., ARAKAWA, E., and ONODERA, N. **[Manufacturing experiment on the extruded particleboard.]** *Wood Ind., Tokyo* 14 (6), 1959 (13–8). [Jap.e.*e*.] P.R.

Presents the results [tabulated in English] of tests made on particle board made from Basswood planer shavings and Oak and Birch hammer-milled particles. Test pieces (28 × 30 × 2 cm.) were obtained from a manually operated horizontal-type extrusion apparatus at a pressure of 600 kg./sq. cm. The properties (impact and bending strengths, Young's modulus, water resistance, etc.) of 5-ply extruded particle-core plywood compared favourably with those of 5-ply wood having a flat-pressed particle core. However, it was difficult to obtain uniform density in the extruding operation and the resultant strength properties varied proportionately.

5345. BURROWS, C. H. **Floor tile from planer shavings**. *Inform. Circ. Ore. For. Prod. Res. Cent.* No. 12, 1958. pp. 21. 7 refs.

Physical properties of floor tiles from Ponderosa Pine shavings compared favourably with linoleum and cork tile, and costs were satisfactory. Manufacturing techniques used were similar to those for particle board.

5346. TALBOTT, J. W. **Flāpreg flakeboard, resin-impregnated, compressed wood flakes**. *For. Prod. J.* 9 (2), 1959 (103–6). 3 refs.

Reports on the development (as yet experimental) of a flakeboard having properties similar to those of compreg, at a much reduced cost. In a comparative test, water absorption of Douglas Fir Flāpreg in 24 hours was $< \frac{1}{3}$ of Sitka Spruce compreg. [Cf. *F.A.* 19 No. 4988.]

5347. LARMORE, F. D. **Influence of specific gravity and resin content on properties of particle board**. *For. Prod. J.* 9 (4), 1959 (131–4). 8 refs.

Boards of equal sp. gr. (0·56 and 0·72) were stronger in bending and tension and more dimensionally stable when made of Aspen flakes (mean basic sp. gr. 0·37) than when made of Yellow Birch (0·65). Differences were smaller in the denser boards. Boards containing 8% resin solids were more stable as to thickness than boards with 4%.

5348. ENGELS, K. Die Dosierung für Spänebeleimungsmischer unter Berücksichtigung von Gewichts- und Volumendosierung. **[Proportioning the particle/glue mix for particle board by weight and volume.]** *Holz Roh- u. Werkstoff* 17 (4), 1959 (134–45). [G.g.e.] P.R.

Discusses factors influencing the operation and describes some of the equipment used for it.

5349. LUNDGREN, S. Å. Das Bendtsen-Prüfgerät für Holzfaser-Hartplatten. **[The Bendtsen hardboard tester.]** *Holz Roh- u. Werkstoff* 17 (3), 1959 (98–102). [G.g.e.] P.R.

Hardboard smoothness is measured by passing a stream of air between a polished metal plate and the surface being tested, and measuring the amount of air passing through per unit of time. The principles, the instrument, and its operation are described in detail.

5350. Baur, E. Fehler bei der Beurteilung von Biegefestigkeiten nach der Gütebestimmung für Holzfaser-Hartplatten DIN 68750. **[Errors in evaluating bending strengths of hardboard according to DIN 68750.]** *Holz Roh- u. Werkstoff* 17 (2), 1959 (61–4). [G.g.e.] P.R.

Shows in a nomogram the possible extent of error due to taking too small a number of samples, and discusses the desirability of statistical quality control.

5351. Packman, D. F. **The production of hardboard from tropical timbers. IV. Caribbean Pitch Pine (*Pinus caribaea*).** *Trop. Sci., Lond.* 1 (1), 1959 (5–12 + 1 plate). 6 refs.

Standard and super hardboards to the requirements of *Brit. Stand.* 1142 were made on an experimental scale from *P. caribaea* by the Defibrator process. The inclusion of 25% by volume of highly resinous heartwood had a beneficial effect on the water resistance of the boards without seriously impairing their strength properties, though an uneven colour in the surface of the boards resulted. The amount liable to occur in waste wood, e.g. sawmill waste and forest thinnings, would be unlikely to affect the boards adversely. *From author's summary.*

5352. Fickler, H. H. Prispevek k izboljšanju tehnoloških lastnosti vlaknenih plošč glede nabrekanja in vpijanja vode. **[The improvement of fibreboard quality in regard to swelling and water absorption.]** *Les, Ljubljana* 10 (2/3), 1958 (28–31). 8 refs. [Sloven.e.g.]

Experiments were carried out in Slovenia, with Swedish co-operation, on the possibility of using wax isolated from Pine oil [no further details given] as a total or partial substitute for phenolic resins in fibreboard manufacture. The water absorption, bending strength and modulus of elasticity of fibreboards made from (*a*) Pine/Spruce (50 : 50), (*b*) Okoumé, and (*c*) coniferous species (70%) + hardwoods (mainly Beech) are tabulated. Results indicate that the wax is a cheap material, suitable for use in fibreboard manufacture, and able to compete with other glues and resins.

5353. Liiri, O. Kovan kuitulevyn valmistus vedetöntä levynmuodostusta käyttämällä. **[Manufacture of hardboard by dry and semi-dry processes.]** *Pap. ja Puu* 41 (3; 4*a*), 1959 (85–96; 147–58). 36 refs. [Fi.e.*e*.] P.R.

Describes manufacturing methods and discusses their relative merits. Presents graphs showing the properties of board produced experimentally from Pine and Birch, concluding that the dry process gives better results, and that Birch boards have higher strength and greater water absorption than Pine, and making recommendations on e.g. pressing conditions, and water and heat treatment.

5354. Huber, H. A. **Preservation of particleboard and hardboard with pentachlorophenol.** *For. Prod. J.* 8 (12), 1958 (357–60). 1 ref.

Experiments were made in adding preservative at different stages of particle-board manufacture—(1) to veneer before chipping, (2) to chips, (3) to sizing material, and (4) to the glues used as binders. It is considered that (4) is the most practical. Addition of Na PCP at rates of ca. 0·6% of oven-dry weight of chips to the phenol-formaldehyde or urea-formaldehyde binder gave full protection in soil-block tests with *Lenzites trabea* without lowering of flexural and water-absorption properties. Similar results were obtained with preservative-treated hardboard. Costs for treatment amount to little more than the cost of the preservative—ca. $3.00/1000 sq. ft. [Cf. *F.A.* 16 No. 2460.]

863. Wood Hydrolysis. Saccharification

5355. Mudretsov [Mudrecov], A. I., and Kozlov, V. N. **Kinetics of wood saccharification.** *Lesn. Ž., Arhangel'sk* 1958 (4), (155–61). [Russ.?] From *abstr.* in *Chem. Abstr.* 53 (7), 1959 (6607). P.R.

A study was made of the hydrolysis of *Pinus sylvestris* in the form of sawdust and 10 × 10 × 5 mm. chips at 170–200° [C.?], an acid/wood ratio of 7–10 : 1, and an H_2SO_4 concentration of 0·5–1·2%. The curve of concentration of reducing sugars against hydrolysis time has an inflection point, and the time for reaching this point is twice as long as that required for reaching the maximum concentration. Hydrolysis of Pine heartwood, sapwood, and branches proceeded at the same reaction rate.

5356. Ito, T., and Nakayama, N. **[Studies on pre-treatment in wood saccharification process. II. Hydrolysis rate of pentosan of hardwood in dilute acetic acid.]** *J. Jap. Wood Res. Soc.* 4 (6), 1958 (223–6). 11 refs. [Jap.e.*e*.] P.R.

Studies the effects of concentrated CH_3COOH and reaction temperature on the rate of hydrolysis of *Fagus crenata* pentosans (acid concentration range 1–12%, temperature 150–190° C.). The results indicate two stages of pentosan hydrolysis, both giving a first-order reaction. Ca. 70–90% of the total pentosan in wood is easily hydrolysed, the amount increasing with the reaction temperature. The following equations indicating hydrolysis rates in both stages were derived:

(i) $K_A = 9{\cdot}63 \times 10^{10} C^{0{\cdot}34} \exp\{-24900/RT\}$

and

(ii) $K_B = 1{\cdot}95 \times 10^{10} C^{0{\cdot}34} \exp\{-24900/RT\}$

where K_A and K_B are the first-order reaction constants in the first and second stages respectively, C is the % concentration of CH_3COOH, R is the gas constant (cal/mol.), and T is the absolute temperature. The value of K_A is 4·9 times that of K_B.

5357. Kaplan, M. N., and Gurevič, Ja. E. Proizvodstvo spirta i furfurola iz produktov predgidroliza drevesiny. **[The production of alcohol and furfural from the products of wood prehydrolysis.]** *Bumažnaja Promyšlennost', Moskva* 33 (2), 1958 (6–8). [Russ.] L.S.

866. Utilization of Wood Extractives

See also No. 4125.

5358. Sternitzke, H. S. **Mississippi's stumpwood supply.** *Naval Stores Rev.* 68 (12), 1959 (12–3).

Field measurements were made on hundreds of sample plots of resinous stumps of Longleaf and Slash Pine, residue of logging operations between 1880 and the 1930s. Reserves now total 4·5 million tons. A little over 2 million are at present available by 'push-dozer' operations, and 2·2 million are potentially available (including stumps where present removal would damage standing timber). Of the total, 35% is in large stumps, 41% in medium-size stumps, and 24% in small. Since 1946 an average of 544,000 tons of stumpwood has been removed annually for resin production.

5359. MELLAN, I., and LUBOWE, I. I. **Sanitizers based on Pine oil.** *Soap* 35 (4), 1959 (74–5, 79, 105). 15 refs. P.R.

Outlines the commercial uses of Pine oil as an emulsifying, wetting and dispersing agent, a penetrant and an activator of pesticidal and germicidal properties in such formulations. Chipped stumps of *Pinus palustris* are processed by (1) steam distillation, (2) destructive distillation, and (3) extraction. The oily layer appearing after (1) is fractionated to obtain Pine oil and wood turpentine oil, and the chips are further treated with solvent to extract more Pine oil, turpentine and rosin by fractional distillation. Apart from the commercial significance of the oil *per se*, the mechanical extraction of the slow-rotting resinous stumps has also alleviated the formerly chronic problem of land-clearance in Pine forests of the southern U.S.A.

867. Destructive Distillation

See also No. 5359.

5360. BAGROVA, R. K., and KOZLOV, V. N. **Birch, Pine, and Spruce wood pyrolysis on heating to various temperatures.** *Trudy Instituta Himii, Akademija Nauk SSSR, Ural'skij Filial (Sbornik Rabot)* 2 (1), 1958 (97–101). [Russ.] From *abstr.* in *Chem. Abstr.* 53 (10), 1959 (9660). P.R.

Birch, Pine and Spruce were subjected to laboratory batch pyrolysis for 6 hours at 300–450° C., the Birch yielding less charcoal, but more gases and liquid products than the other woods. These differences were more pronounced at 300–350° than at higher temperatures. The liberation of volatile acids, alcohols, aldehydes, and H_2O is complete for all species at 350–380°. Specific gas absorption for the carbons obtained was also measured as a function of the final pyrolysis temperature.

5361. HAIGH, P. D. **Equipment and costs for profitable charcoal briquetting.** *For. Prod. J.* 8 (10), 1958 (66*A*–68*A*).

Covers selection of charcoal (mostly hardwood), comparison of large and small plants (apparatus, labour, binders, processing), investment and operating costs, in the context of the recent expanding demand in N. America for briquettes for outdoor cooking.

5362. DOUGALL, D. K., and WHITE, D. E. **The chemistry of Western Australian plants. X. The 'primary' tars from Jarrah and Karri sawdusts.** *Aust. J. appl. Sci.* 9 (4), 1958 (404–9). 4 refs. P.R.

[Cf. *F.A.* 17 No. 1989.] The 'primary' tars obtained by distilling Jarrah [*Eucalyptus marginata*] and Karri [*E. diversicolor*] sawdusts *in vacuo* were separated into fractions by steam distillation followed by extraction of the distillate and the aqueous residue with solvents. Examination of some fractions of the Jarrah tar indicated the presence of 1,6-anhydro-β-*D*-glucopyranose, 5-methylfurfural, catechol and 2,6-dimethoxyphenol, which were identified as derivatives, and also the compound $C_6H_{12}O_7$, containing hydroxyl, carbonyl, and ester groups, and a 2,4-dinitrophenylhydrazone, $C_{14}H_{12}O_7N_4$. Only the non-volatile, water-soluble fraction of the Karri tar was examined; no 1,6-anhydro-β-*D*-glucopyranose was isolated.

89. Other ('Minor') Forest Products

891. Mineral Products (including Peat and Coal)

See also No. 4122.

5363. DONALD, D. D. **Mineral exploration as a function of land management.** *J. For.* 57 (3), 1959 (176–9).

Discusses the 'mineral potential' (i.e. the possibility of valuable mineral deposits underlying forest land); the general steps in a mineral exploration programme, viz. geological reconnaissance (mainly by air), subsequent investigation, and testing, and finally the initiation and financing of an exploration programme.

892. Vegetable Products

892.1. Grass. Litter. Leaf Fodder etc.

5364. FOLGADO, J. DOS S. CRESPO. Digestibilidade e valor alimentar das folhas do ulmeiro e choupo. **[Digestibility and fodder value of Elm and Poplar leaves.]** *Estud. Inform. Serv. flor. aqüic. Portugal* No. 104-*G*3, 1959. pp. 16. 20 refs. [Port.e.] Limited distribution.

Reports trials to estimate the fodder value to sheep of leaves of (1) *Ulmus carpinifolia* and (2) *Populus nigra* during July, August and September. Digestibility of dry matter was 46·4% for (1) and 68·9% for (2), total digestive nutrients 23·3% and 30·6%, and Scandinavian fodder units respectively 26·5/100 kg. and 33·6/100 kg. *From author's summary.*

5365. PATEL, B. M., and PATEL, P. S. **Fodder value of tree and vegetable leaves in Kaira district.** *Indian Journal of Agricultural Science, Delhi* 27 (3), 1957 (307–15). 14 refs. O.R.E.

Tabulates results of chemical analyses of leaves of *Ficus bengalensis*, *Eugenia jambolana*, *Bassia longifolia*, *Mangifera indica*, *Melia azadirachta*, *F. religiosa*, *Mimusops hexandra*, *Tamarindus indica* and *Zizyphus jujuba*, and compares their fodder value with that of cabbage, cauliflower etc.

892.4. Bark Products. Tanstuffs. Cork

See also Nos. 4125, 4241, 5342–3.

5366. **Bark utilization.** *For. Prod. J.* 9 (4), 1959 (19*A*–42*A*). 19 refs.

A special feature, with articles on bark recovery (estimated at 1 lb./bd. ft. for Western conifers), preparation, comminution and uses (chemical, industrial, horticultural, etc.) including hardboard manufacture [cf. *F.A.* 20 No. 1233], composting (*E. P. Ivory* and *P. Field*), N-depletion and toxic effects of various sizes of bark and wood fragment used as mulches etc. (*O. R. Lunt* and *B. Clark*) and the preparation of an enriched, neutralized soil improver 'Sempergrow' from Redwood and Douglas Fir bark after its use for 2 or 3 months as a trickling-filter medium for effluent purification (*R. E. Burton*).

5367. Žitkov, A. V. Drevesnaja kora i ee svojstva. **[Wood bark and its properties.]** *Bumažnaja Promyšlennost', Moskva* 33 (2), 1958 (4–6). 3 refs. [Russ.] L.S.

From experiments at the Leningrad paper factory, shows, with tables, for Pine and Spruce bark, the relationship of thickness to stem diam., density, drying properties, mechanical properties, calorific value, chemical composition and products of dry distillation and gasification.

5368. Endres, H. Die Konstitution des Fichtenrindengerbstoffes, einer neuen Klasse kondensierbarer, vegetabilischer Gerbstoffe. **[The composition of Spruce bark tannin, a new class of condensable vegetable tannins.]** *Qualit. Plant. Mater. Veg.* 5 (4), 1959 (367–74). 28 refs. [G.g.e.] E.M.B.

The bast of Spruce bark, containing 15–17% of tanstuffs, was extracted with ethyl acetate and with ethanol. From the ethyl-acetate extract, two crystalline phenolic compounds were isolated. The main product was identified as 2,5,6,3′4′-pentahydroxy-3,3-tetramethylenestilbene, and is here named piceatannol. The second phenol is a piceatannol derivative. The ethanolic extract contained nearly 50% of a monoglucosido-piceatannol. The properties of piceatannol were determined.

5369. Pardo, L. L. El fruto de 'guayacan' (*Caesalpinia paraguariensis* (D. Parodi Burk))—sus posibilidades en la industria curtiente. **[The fruit of *C. paraguariensis*—its possibilities in the tanning industry.]** *Bol. argent. for.* 17 (169), 1959 (4). [Span.]

Discusses the possibilities of the commercial use of tannin from fruit of *C. paraguariensis*, and presents the results of analyses made by G. C. Durlach at the forest research laboratories, Buenos Aires.

5370. Marian, J. E., and Wissing, A. **The utilization of bark. Part 3. The utilization of polyphenols in Spruce bark extractives in adhesives.** *Svensk PappTidn.* 62 (6), 1959 (187–93). 20 refs. [E.e.sw.g.] P.R.

[Cf. *F.A.* 19 No. 1178.] Reviews literature and presents results of experiments. Normal commercial Spruce bark extracts appeared unsuitable for use as resin constituents in adhesives. An extract enriched with reactive polyphenols gave a plywood adhesive with good dry strength but poor resistance to boiling water.

5371. Brooker, E. G. **Chemistry of the *Coprosma* genus. Part XI. The colouring matters from *Coprosma foetidissima*.** *J. chem. Soc.* Jan., 1959 (470). O.R.S.

Presents the results of successive petroleum, benzene, ether and methanol extractions of the air-dried stem bark. [Cf. *F.A.* 17 No. 2258.]

5372. Cambie, R. C. **The extractives of *Quintinia serrata*.** *J. chem. Soc.* Feb., 1959 (848–9). 8 refs. O.R.S.

Astilbin and dihydroquercetin were extracted from the dried bark. Neither was found by paper chromatography in a methanolic extract of the leaves.

892.5. Medicinal Plants, Edible Plants, Insecticides from Plants, etc.

5373. Oliver, B. **Nigeria's useful plants. Part II. Medicinal plants (2).** *Nigerian Field* 24 (2), 1959 (54–71).

[Cf. *F.A.* 20 Nos. 2600, 3953.] From *Cassia* to *Fagara* (ca. 70 spp.), giving notes on the chemical principles contained and their uses in European and native medicine.

5374. Schmutz, J. Die Alkaloide von *Xylopia discreta* (L. fil.) Sprague et Hutchins. **[The alkaloids [of the bark] of *X. discreta*.]** *Helv. chim. Acta* 42 (1), 1959 (335–43). 23 refs. [G.g.] O.R.S.

5375. Tomita, M., and Ishii, H. **[Studies on the alkaloids of rutaceous plants. IV. Alkaloids of [the wood and bark of] *Xanthoxylum ailanthoides* Sieb. et Zucc. (*Fagara ailanthoides* (Sieb. et Zucc.) Engl.). (1).]** *J. pharm. Soc. Japan* 78 (12), 1958 (1441–3). 8 refs. [Jap.e.] O.R.S.

5376. Tomita, M., and Kunitomo, J. **[Studies on the alkaloids of rutaceous plants. V. Alkaloids of *Phellodendron amurense* Rupr. var. *sachalinense* Fr. Schm.]** *J. pharm. Soc. Japan* 78 (12), 1958 (1444–7). 3 refs. [Jap.e.] O.R.S. [Cf. *F.A.* 20 No. 1253.]

5377. Kimura, K., *et al.* **[Studies on the components of *Sophora japonica* L. II. On the structure of sophoradiol [from the dried buds].]** *J. pharm. Soc. Japan* 78 (10), 1958 (1090–4). 11 refs. [Jap.e.e.] O.R.S.

5378. Thudium, F., Schindler, O., and Reichstein, T. Die Glykoside von *Acokanthera schimperi* (A. DC.) Benth. et Hook. 3. Mitteilung. Untersuchung der Samen der Form die von den Wa-Giriama zur Pfeilgiftbereitung verwendet wird. **[The glycosides of *A. schimperi*. 3. Studies on the seeds of the form used by the Wa-Giriama for arrow-poison.]** *Helv. chim. Acta* 42 (1), 1959 (2–49). Many refs. [G.g.] O.R.S. [Cf. *F.A.* 20 No. 3966.]

892.6. Resin and Turpentine. Essential Oils. Fixed Oils and Fats. Gums. Latex. Dyestuffs. Sap Sugar.

See also Nos. 4246, 5358–9.

5379. Andreopoulos, Ch. Hē krisis tēs rhētinoparagōgēs kai hē anankē systaseōs synetairistikēs henōseōs ē koinopraxias rhētinikōn proïontōn. **[The crisis in resin production and the need for co-operation of the parties involved.]** *Das. Chron.* 1 (6), 1959 (247–54). [Gk.]

The author adduces figures of output and prices of turpentine and rosin since 1950 and of export of both to Greece's chief European markets, to show the great drop in tonnage (30%) and value (38%), for which China's entry into the market is partly blamed. He recommends *inter alia* forming a body in Greece similar to the Union Corporative des Résineux at Bordeaux, the improvement of resin distilleries, collection and storage techniques, abolition of the outdated and severe local and central taxes, amounting to 17% of the [sale?] value, and trade agreements with consumers outside the European Common Market.

5380. KHAN, A. H. **The essential oil bearing plants of Pakistan. Part I.** *Pakistan J. For.* 8 (3), 1958 (262–89 + 34 photos). Many refs.

Covers Amaryllidaceae-Linaceae (arranged in alphabetical order of families).

5381. HELLYER, R. O. **The volatile leaf oil of *Melaleuca ericifolia*** Sm. *Aust. J. Chem.* 10 (4), 1958 (509–12). 4 refs. O.R.S.

5382. OLAECHEA, V. P. La materia prima argentina. Obtención de goma a partir de la semilla de *Gleditsia triacanthos* L. **[Raw materials of Argentina. Gum from seeds of *G. triacanthos*.]** *Bol. argent. for.* 17 (168), 1958 (6). [Span.]

Presents the results of experiments in the extraction of gum from the endosperm of *G. triacanthos*. Products of 6 grades of purity were obtained. Their properties are listed and compared with those of known commercial products. The results indicate a possible commercial future for gum of *G. triacathos*.

5383. GARCÍA MARTÍN, D., and TORNER OCHOA, J. Sobre la 'acacia de tres puas'—*Gleditschia triacanthos*, L.—y, especialmente, sobre el aprovechamiento de su fruto. El mucilago de sus semillas y la 'goma garrofín'. **[*Gleditsia triacanthos*, with particular reference to the utilization of its fruit. The seed gum [compared with] Carob seed gum.]** [*Bol.*] *Inst. for. Invest. Exp., Madrid* 29 (77), 1958. pp. 62 + 4 plates. 79 refs. [Span.span.g.e.f.]

The study begins with a description of the tree, its distribution in America, and its silvicultural characters. It grows well on poor and sandy soils, and is frost- and drought-resistant. Data are presented on the chemistry of the wood and leaves. The main part of the work consists of a study of the chemistry of the fruit and seed (both reviewing other authors' work and presenting original data), and the chemistry and properties of the seed gum. It is compared with Carob seed gum, which is also studied from the point of view of chemistry, uses and industrial production in Spain. It is concluded that gum of *G. triacanthos* may well compete with Carob seed gum as regards both properties and price.

5384. ADAMS, G. A., BISHOP, C. T., and McDONALD, I. J. **Polysaccharides from the sap of the Sugar Maple (*Acer saccharinum*).** *Canad. J. Biochem. Physiol.* 37 (3), 1959 (507–10). 7 refs. O.R.S.

Analysis of 12 samples collected between 18 March and 11 April 1958 showed that arabinose and galactose were the predominant monosaccharides, rhamnose was present in all samples, and traces of xylose were present from late March. Results from sap collected non-aseptically from a commercial stand are also given and indicate that the predominant polysaccharide is an arabogalactan; it is unlikely to be related to the cell-wall hemicelluloses, which are primarily acidic xylans.

892.7. Fruits. Seeds. Fibres, Yarns and Flosses

See Nos. 4235, 4240–1, 5369, 5382–3.

892.8. Heather. Broom etc. Osiers. Canes and Bamboos. Reeds and Rushes. Thatching Materials

See No. 4611.

9. FORESTS AND FORESTRY FROM THE NATIONAL POINT OF VIEW. SOCIAL ECONOMICS OF FORESTRY

90. General

See also Nos. 4037, 5039.

5385. SCHWOTZER, W. Die Forstwirtschaft im Dienste der Planwirtschaft Osteuropas. **[Forestry in the planned economies of Eastern Europe.]** *Schweiz. Z. Forstw.* 110 (4), 1959 (255–69). 13 refs. [G.f.]

A lecture discussing organization and administration, nationalized and cooperative forests, research and training, planning, allocation of targets, etc., with examples chiefly from E. Germany.

5386. **National progress reports on forestry: Period 1957 and 1958.** [*Docum.*] *10th Sess. FAO European For. Comm., Rome 1959* Nos. *FAO/EFC*-59/5, 9, 12, 15–19, 21. 1959. [E.,F. or Span.]

(5) Austria (pp. 18); (9) Italy (pp. 26); (12) Spain (pp. 44); (15) Cyprus (pp. 55); (16) Great Britain (pp. 18); (17) Northern Ireland (pp. 10); (18) Belgium (pp. 16); (19) France (pp. 38); (21) Switzerland (pp. 12).

5387. CHIEH, W. **China's first five-year plan [1953–57] in forestry work.** *Aust. For.* 22 (1), 1958 (19–23 + 3 photos).

Brief notes on general policy and on afforestation for soil and water conservation and for timber production. [Cf. *F.A.* 20 No. 5427.]

5388. AHMAD, M. R. **Notes of inspection on the forests of West Pakistan (1955–1957).** *W. Pakistan For. Dep. Rep.* No. 1, 1957. pp. v + 102 + 4 maps etc. in pocket.

5389. MOONEY, H. F. **Report on the scope for forestry in Somalia.** British Middle East Development Division, Addis Ababa. 1959. pp. 10. Limited distribution.

Includes a forest policy drafted for the Somaliland

Protectorate, with suggestions on modifications for Somalia and sections on the forests and arboricultural work seen, the firewood and charcoal business, frankincense, myrrh and gum arabic, staff, revenue and expenditure. [Cf. *F.A.* 20 No. 5404.]

902. History of Forests and Forestry

See also Nos. 4309–12, 4352.

5390. Edlin, H. L. **The history of forests and land use in Wales.** *Quart. J. For.* 53 (2), 1959 (144–50). 5 refs.

[Cf. *F.A.* 20 No. 3987.] In prehistoric times the forest cover of Wales was probably ca. 70%, in 1871 only 2·5%, and in 1947 6·2%. The causes of the disappearance of > 3 million acres of woodland are examined, using evidence from geographers, archaeologists, folk-lorists, historians and poets, and attributed entirely to human activities—clearances for agriculture, the *hafod*-and-*hendre* system (transhumance) with its close grazing of mountainsides, forest clearance for timber and tanbark exports to England, shipbuilding and mine timbers, and charcoal for ore smelting. It is considered that knowledge of how and why the forests went, will assist those now engaged in reforestation in Wales.

5391. Edlin, H. L. **Place names as a guide to former forest cover in the Grampians [Scotland].** *Scot. For.* 13 (2), 1959 (63–7). [Cf. *F.A.* 20 No. 3987.]

5392. Eichler, E. Zur Auswertung slawischer Orts- und Flurnamen für die Waldgeschichte. **[Appraisal of Slav place and field names for forest history [in S. Germany].]** *Arch. Forstw.* 8 (2), 1959 (161–9). 32 refs. [G.g.russ.e.]

5393. Berard, A. Les reboisements artificiels dans les forêts vosgiennes au XIX^e siècle. **[Artificial regeneration in the forests of the Vosges in the 19th century.]** *Rev. for. franç.* 11 (5), 1959 (371–5). 8 refs. [F.]

5394. Nožička, J. Přehled vývoje našich lesů. **[Historical review of the development of the forests of Czechoslovakia.]** *Lesn. Knihovna* (*velká Řada*) No. 23, 1957. pp. 462. 7½ pp. of refs. [Cz.russ.g.e.]

Divides the history into 3 main periods: from prehistoric times to 1754, 1754–1848, and 1848–1914. There is a 5-page English summary, and indexes of proper names, places, and subjects.

5395. Hosmer, R. S. **The beginning five decades of forestry in Hawaii.** *J. For.* 57 (2), 1959 (83–9). 14 refs.

Reviews organized forestry in Hawaii, discussing also the part played by leading American foresters who have helped in development and reforestation.

903. Forest Policy, General

5396. Chapman, G. W. **Report to the Government of Iraq on forestry development.** Expanded Technical Assistance Program, FAO, Rome. *FAO Report* No. 1040, 1959. pp. 12. 2 refs. Limited distribution.

A final report of the author's second mission to the country [cf. *F.A.* 12 No. 41] advising on the implementation of development plans with emphasis on watershed protection, protection of croplands in the plains, production of wood, and enhancement of amenities.

5397. **Program for the National Forests.** *Misc. Publ. U.S. Dep. Agric.* No. 794, 1959. pp. 26.

Describes the policy of development, management, protection and research for the U.S. national forests.

904. General Regional Accounts of Forests and Forestry

5398. Dickson, J. A., and Innes, R. A. **Forestry in North Scotland.** *Forestry* 32 (1), 1959 (65–109 + 12 photos). 14 refs.

History, climate, geology, and soils are dealt with in general terms and the history of land use from the 17th century in the seven crofting counties is discussed, while the problems of integration of forestry and agriculture are considered. The Forestry Commission forests in the North Conservancy are described. The forests are grouped into six different groups, the forests in each having certain common characteristics. Problems of physiography, geology, soils, species selection, silviculture, management, and utilization are dealt with for each group. *Authors' summary.*

5399. Price, M. P. **A visit to the forests of France.** *Quart. J. For.* 53 (2), 1959 (109–15).

Description of silviculture and management in Beech, Oak/Beech, and *Abies alba* forests, with observations on 4 *Pinus nigra* vars.: *P.n.* var. *calabrica* produces more timber per tree than *P.n.* var. *corsicana*, and both have better-quality timber with fewer knots than *P.n.* var. *austriaca* and *P.n.* var. *taurida* (from the Crimea).

5400. Krušné hory. **[The Erzgebirge.]** *Zpravy VÚLH, Praha* 3 (1), 1957 (1–40). Many refs. [Cz.]

A collection of articles covering the history of the forests in the Erzgebirge; climate, geology, soil; vegetation types; the influence of ground-water level; injuries caused by natural atmospheric agencies and smoke; the chief pests and diseases; silviculture, a plan for research and ca. 170 references, almost entirely German, on the forests.

5401. **Forestry in Israel.** Society of Israeli Foresters, Tel-Aviv. 1959. pp. 19. [E.]

A small, fully illustrated booklet reviewing the organization and development of forestry in Israel from 1948, and outlining its industrial aims within the framework of the national economy (viz. timber for construction, packing cases, pulp and paper, and fibreboard). Mention is made of the fast-growing species used (mainly various *Eucalyptus* spp., Aleppo and Brutia Pine, Mediterranean Cypress, and Carob for fodder), and of a special planting technique based on the 'méthode steppique' as practised in Algeria, involving the use of large tractor-drawn subsoilers (ploughing depth 60–80 cm.) and angledozers (ridge height 60 cm.). Trees planted on these ridges (planting depth, 30 cm.; spacing 2–3 m., and 3–4 m. between rows) are claimed to have an excellent start and to show rapid development.

5402. Chopra, R. S. **Forests of Himachal Pradesh and their management**. *Indian For.* 85 (4), 1959 (225–32).

Among serious problems are widespread erosion from over-grazing, lopping etc., the burden of rights, and lack of staff for control and development. Most of the working plans have expired.

5403. Foggie, A. Forêts et foresterie au Ghana. **[Forests and forestry in Ghana.]** *Bois For. Trop.* No. 65, 1959 (3–36). 12 refs. [F.]

5404. Mooney, H. F. **Notes on a short visit to the Somaliland Protectorate**. British Middle East Development Division, Addis Ababa. 1959. pp. 7. Limited distribution.

Brief notes on the problems of individual areas visited. [Cf. *F.A.* 20 No. 5389.]

5405. Chalmers, W. S. **Observations on some Caribbean forests**. *Carib. For.* 19 (1/2), 1958 (30–42). 12 refs.

Notes on a visit to Haiti, the Dominican Republic, Puerto Rico, British Guiana and Trinidad, with particular reference to the natural forests of *Pinus occidentalis* in Hispaniola and the planting of *P. caribaea* in Trinidad and British Guiana. The method of sale, felling and extraction of *Cecropia peltata* for a recently developed fibre-cement board ('Insuldyne') now in full-scale production in Puerto Rico is described.

905. Forest Statistics and Resources

See also Nos. 5081, 5206, 5358.

5406. Streyffert, T. **World timber: trends and prospects**. Almquist and Wiksell, Stockholm. 1958. pp. 246. Many refs. [E.] Price [£2. 17*s*.]

An analysis based on a study of forest resources and markets for forest products in all principal regions of the world down to 1955, with a forecast of the position in 2000 A.D. Statistical data are set out in a large number of graphs and tables.

5407. Ergebnisse der österreichischen Waldstandsaufnahme 1952/56. Band 8, Vorarlberg. Band 9, Wien. **[Results of the Austrian forest survey 1952–56. Vol. 8, Vorarlberg. Vol. 9, Vienna.]** Forstliche Bundes-Versuchsanstalt Mariabrunn in Schönbrunn, Wien. 1959. pp. 100 + 146 + 22; pp. 77 + 131. [G.] [Cf. *F.A.* 19 No. 5038.]

5408. Bundesergebnisse der Waldstandsaufnahme für den Kleinwald. **[Results of the Austrian forest survey as relating to small forests [farm forests].]** *Allg. Forstztg.* 70 (9/10), 1959 (115–8). [G.]

Presents and discusses data on area, stand volumes, age structure, yield etc. by provinces, of unmanaged woodlands, and means of improvement, seen mainly in voluntary association and supervision. Conditions in the Western provinces, where these are practised, are better than elsewhere.

5409. Kasprzyk, S. Lasy i leśnictwo polskie w zwierciadle statystyki. I. II. III. **[Forests and forestry of Poland viewed statistically. I-III.]** *Las Polski* 32 (9–11), 1958 (5–7; 3–5; 2–4). [Pol.]

Gives data on the % forest cover of the various regions of the country; actual forest area; forest ownership; proportions of species for the country as a whole and by regions; the volume of fellings; uses of the wood; imports and exports; education; etc. Most of the data cover the period 1949–56.

5410. Thalassinos, D. Ta hellēnika dasē elatēs. **[The Fir forests of Greece.]** *Das. Chron.* 1 (5), 1959 (195–9). [Gk.]

Estimates based on available data put the total Fir area at ca. 320,000 ha., of which 270,000 ha. are state-owned. Through uncontrolled clearances, fire, and over-grazing, the forests are diminishing rapidly in area and value; only 45,000 ha. exceed a stocking of 140 cu.m./ha. and nearly 100,000 ha. have only 30–80 cu.m./ha. The annual output of commercial timber, ca. 120,000 cu.m., which exceeds the c.a.i., comes mainly from the private forests.

5411. Mohanty, A. P. **Bamboo resources of Orissa**. *Indian For.* 85 (2), 1959 (115–8).

Briefly describes the methods employed in a recent survey of the Bamboo resources of the province with a view to their use in paper making. The results indicate that 435,000 tons of Bamboo (399,000 tons being *Dendrocalamus strictus*) should be available.

5412. **Forest Resources Inventory 1956. Report No. 4. Mountain forest section.** Manitoba Forest Service, Winnipeg. 1958. pp. 30.

5413. Hawboldt, L. S., and Bulmer, R. M. **The forest resources of Nova Scotia**. Department of Lands and Forests, Province of Nova Scotia. 1958. pp. 171. 14 refs.

5414. Ferguson, R. H. **The timber resources of Pennsylvania**. Northeastern Forest Experiment Station, Upper Darby, Pa. 1958. pp. 46.

5415. Ferguson, R. H. **The timber resources of Delaware. Northeastern Forest Experiment Station, Upper Darby, Pa.** 1959. pp. 30.

Presents the results of an aerial survey with ground sampling made in 1957, showing the area and condition of forest land, volume of standing timber, annual growth and mortality, and the extent of timber felling. Survey methods are described.

5416. Callahan, J. C., and Stoops, G. R. **Hardwoods of Southern Indiana: resources and conversion opportunities**. *Res. Bull. Ind. agric. Exp. Sta.* No. 662, 1958. pp. 16. 30 refs.

Gives figures for acreage, standing volume, distribution etc. of hardwoods, present uses and possible new uses.

5417. **Forest resources of 13 counties in Southeastern Wisconsin.** *Wis. For. Invent. Publ. Wis. Conserv. Dep.* No. 35, 1958. pp. 53.

5418. **Forest resources of ten counties in East Central Wisconsin.** *Wis. For. Invent. Publ. Wis. Conserv. Dep.* No. 34, 1958. pp. 48.

5419. Thornton, P. L., and Morgan, J. T. **The forest resources of Iowa**. *For. Surv. Release Cent. St. For. Exp. Sta.* No. 22, 1959. pp. 46.

5420. HEINSDIJK, D. **Report to the Government of Brazil on a forest inventory in the Amazon Valley. Part II. Region between Rio Xingú and Rio Tocantins. Part III. Region between Rio Tapajos and Rio Madeira. Part IV. Region between Rio Tocantins and Rios Guamà and Capim.** Expanded Technical Assistance Program, FAO, Rome. *FAO Report* No. 949, 1958, pp. 94 + 14 gphs. & dgms., 1 map; *FAO Report* No. 969, 1958, pp. 83 + xvii + 1 tbl., 13 gphs. & dgms., 2 maps; *FAO Report* No. 992, 1958, pp. 72 + xvii + 1 tbl., 9 gphs. & dgms., 2 maps. [E.] Limited distribution.

Each report is in two parts: (I) Description of non-swamp forest types; (II) Economic aspects, with appendices on species found, frequency curves of species and diameter classes in different forest types, etc. Legends to maps are mainly in Spanish. [Cf. *F.A.* 19 No. 773.]

907. Indirect Significance of Forests. Rural Amenity etc.

See also No. 4524.

5421. ROUBAL, R. Tatranský Národný Park. **[The Tatra National Park.]** *Sborn. Prác Tatr. Nar. Parku, Tatr. Lomnica* No. 1, 1958 (5–18). [Slovak. Russ.G.Hu.]

A brief account of the setting-up of the Park in 1948, together with the German and Hungarian versions of the law passed by the Slovakian National Council, 18 Dec., 1948, establishing and protecting the Park, defining aims, outlining administration, etc.

908. Relationship to Other Branches of Husbandry and Industry

5422. **Multiple-use forestry in the changing West.** *Proc. Soc. Amer. For.* 1958 (1959). pp. 215. Many refs.

Contains over 70 articles, many of which are noticed separately, chiefly on the combination of management for timber with other important uses such as education, recreation, wild life, livestock grazing and conservation of water catchments.

91. Land Use, Land-Use Policy (including Afforestation Policy)

See also Nos. 4343, 5363, 5387, 5390, 5422, 5446.

5423. DICKIE, M. A. M. **Rural development surveys in Scotland.** *Forestry* 32 (1), 1959 (53–64). 7 refs.

A review of the surveys being undertaken to secure the integration of forestry and agriculture, with an indication of the objectives, the methods employed, the difficulties encountered, and the results achieved. The attempt to secure full and sound land-use is being made on a voluntary basis and progress is slow, but there is promise that forestry can be integrated with agriculture in hill areas with little or no loss in stock-carrying capacity, that the shepherd population can be retained in the glens and that the whole rural economy can be given fresh vigour. A major hindrance to rapid development of plans in survey areas is the lack of clear and demonstrable proof of the value of shelter and of well founded directions on how best to obtain and maintain shelter, whether by belts or blocks. *Author's summary.*

5424. **Report of the Forest of Dean Committee 1958.** H.M. Stationery Office, London. *Cmnd.* 686, 1959. pp. v + 58 + 2 maps in pocket. Price 8*s.*

The terms of reference of the Committee, set up by the Forestry Commission in 1955, were "to review the situation in the Forest of Dean, and having regard to all existing rights and interests, to recommend such measures as they consider desirable and necessary to secure that the administration of the Forest, more particularly as regards the grazing of animals, may be adjusted to modern requirements'. The principal recommendation is that sheep should in due course be removed from the Open Forest and either confined to special enclosures or eliminated altogether.

5425. GEŌRGOUSIS, S. To programma anaptyxeōs Ēpeirou. **[The development programme for Ipiros.]** *Das. Chron.* 1 (6), 1959 (255–9). [Gk.]

Describes the rehabilitation work started round Konitsa in a community of ca. 38,000 people in Sept. 1958 by the Greek government with the help of O.E.E.C. and E.P.A. experts. Besides soil stabilization and hydrological work, ca. 2000 stremmas have been planted with Black Pine [*Pinus nigra*] and 2 nurseries totalling 95 stremmas established. Main heads of expenditure for 1959 are detailed.

5426. AHMAD, S.-u.-D. **An international study of the arid-zone land use problems. Part II.** *Pakistan J. For.* 9 (2), 1959 (96–117). 143 refs.

Reviews post-war research, afforestation schemes, dune fixation, etc. in the U.S.A., Russia, N. Africa, Israel and Pakistan.

5427. CHIH, F.-J. Le reboisement du désert chinois. **[Afforestation in the Chinese desert.]** *Rev. int. Bois* 26 (249), 1959 (27, 29). [F.]

Briefly describes [without indicating sources] the achievements of the past 9 years, chiefly in creating thousands of km. of shelterbelts and windbreaks on the fringes of the Gobi desert, the re-establishment of vegetation by protection against man and beast, and the even more ambitious plans for afforesting 110 million ha. of stony plains and shifting sands by workers' communes, involving irrigation schemes, artificial precipitation etc. The successful planting of 'desert Poplars' [unspecified] is mentioned. [Cf. *F.A.* 20 No. 5387.]

92. Forest Ownership and Ownership Policy

See also Nos. 5408, 5424.

5428. LIMBURG STIRUM, C. DE. La forêt privée. **[The private forests [of Belgium].]** *Bull. Soc. for. Belg.* 66 (2), 1959 (129–44). [F.]

A lecture given at the Exhibition in Brussels, including data on total acreage, size of holdings, management (if any), Poplar-growing by the Union Allumettière and others, experiments with exotics, etc. [Cf. *F.A.* 19 No. 5025.]

5429. JACOBY, E. H. **Land consolidation in Europe.** *Publication, International Institute for Land*

Reclamation and Improvement, Wageningen No. 3, 1959. pp. 142 + 2 maps. [E.]

A study prepared by a working party of the subcommission on land and water use of the European Commission on Agriculture, FAO, issued in E., F., and G. A short section is devoted to the technical problems of forest areas. Appendices contain extracts from country reports, lists of legal enactments, etc.

93. Public Supervision and Regulation of Forestry, including Legislation for these Purposes

See also Nos. 5424, 5429.

5430. Orman kanunu lâyihası, ziraat ve muvakkat encümenleri mazbataları. **[A forest law [No. 6831, for Turkey]. Draft with proceedings of the Agricultural and Temporary Committees.]** Türkiye Ormancılar Cemiyeti, Ankara. 1957. pp. 614. [Turk.]

The law is given in full (119 sections) on pp. 555–77, followed by amendments that were rejected.

5431. **Forests Act and Forests Act Regulations 1918–1954 and Sandalwood Act [of Western Australia.]** Government Printer, Perth. 1958. pp. [81].

Approved reprints of the Acts and Regulations as amended, with an alphabetical index.

5432. SCHWARZ, H. Gesetzliche Bestimmungen über die Waldbewertung in Österreich. **[Legal enactments dealing with forest valuation in Austria.]** *Öst. Vjschr. Forstw.* 100 (1), 1959 (21–60). 23 refs. [G.]

Reproduces the relevant sections of various laws and regulations.

94. Other Methods to Implement Forest Policy

944. Co-operation. Collaboration of Forest Owners

5433. VAISSIÈRE, J. DE. Les groupements forestiers. **[Grouping of forest estates.]** *Bull. Soc. for. Belg.* 66 (5), 1959 (253–78). [F.]

The Inspecteur Générale des Eaux et Forêts, Paris, explains the situation as regards small private forests, which led to the forest law of Dec. 1954 [see *F.A.* 16 p. 595] providing for the grouping of scattered private forests or land destined for afforestation, with tax remission etc. Up to the present, 430 such groups have been formed, covering a total of 180,219 ha., distributed in 69 out of the 90 départements of France.

5434. MASON, D. T., and HENZE, K. D. **The Shelton Co-operative Sustained Yield Unit.** *J. For.* 57 (3), 1959 (163–8). 5 refs.

[Cf. Granger, *F.A.* 6 p. 204.] The Unit was set up by the U.S. Forest Service and the Simpson Logging Co. in 1946; its operation during the first decade is reviewed.

945.2. Publicity, Propaganda (including Demonstration Forests)

5435. STANISŁAWSKI, A. Filmy o tematyce leśnej: ważny oręż propagandy i szkolenia. **[Films on forestry: an important medium of publicity and education.]** *Las Polski* 33 (1), 1959 (2–5). [Pol.]

Discusses the use of films and television for forestry publicity in Poland, and the forestry section of the International Scientific Film Congress held in Moscow, 10–20 Sept., 1958.

5436. AUGHANBAUGH, J. **Experimental woodlands as a means of encouraging improved management of small tracts.** *J. For.* 57 (6), 1959 (409–12). 11 refs.

Summarizes growing-stock data (trees/acre; bd. ft./acre) from, and management principles applied in, two typical experimental farm woods (20 and 47 acres, both uneven-aged, fenced, Beech/Maple stands managed for Maple syrup and timber) in Ohio, set up as study and demonstration areas in 1946. These areas, which show the profitability of properly run farm woodlots, are thought to be the best method of encouraging good management on the farm forests which form a considerable % of Ohio's commercial forest land.

945.3. Education. Training. (Including Educational Tours and Information on Careers)

See Nos. 5063, 5065.

945.4. Research

See also Nos. 5063–5.

5437. KURTH, A. Organisation, Tätigkeit und Bauten der Eidg. Anstalt für das forstliche Versuchswesen. **[The organization, activities and buildings of the Federal Research Institute.]** *Schweiz. Z. Forstw.* 110 (5), 1959 (301–8 + 9 photos). [G.]

An illustrated description of the new buildings at Birmendorf near Zurich, occupied in 1958. The Institute now comprises 3 research sections with 5 subsections each: (I) Climatology, soils, vegetation, entomology and phytopathology; (II) Breeding and silviculture; (III) Management and utilization, plus an administrative section. There are 15 research specialists [cf. *F.A.* 13 p. 131; 18 No. 2364].

5438. Dare de seamă asupra cercetărilor efectuate în intervalul 1933–1957. **[Report on research carried out [at the Rumanian Institute of Forest Research], 1933–57.]** [*Publ.*] *Inst. Cerc. silv., Bucureşti* (*Ser. a II-a*) No 17, 1958. pp. 99. [Rum.]

Includes a list of publications.

5439. KHALIL, M. A. K. **Forest problem analysis and research programme for Pakistan.** *Pakistan J. For.* 8 (2), 1958 (149–79).

Briefly reviews the forest resources and makes detailed proposals for a long-term research programme.

5440. **Regional programme of forestry research 1958/1959.** *Reg. Res. Progr.* (*Agric.*) *E. Afr. High Comm., Nairobi* 1958 (73–83). Price 10*s.*

Lists projects in progress in Kenya, Tanganyika and Uganda, arranged according to the Oxford Decimal Classification.

5441. DAWKINS, H. C. **Silvicultural Research Plan. First revision. Period 1959 to 1963 inclusive.** Forest Department, Uganda. 1958. pp. 24 + pp. 44 in 14 appendices. 85 refs.

Officially authorized instructions, covering policy, problems and priorities, plans for research projects, procedure, staff and finance. The present status of ca. 380 research plots is detailed.

5442. **The first decade of management and research—U.B.C. Forest 1949–1958.** University of British Columbia, Vancouver. [1959]. pp. 82.

Includes notes on research in progress.

5443. **A guide to field laboratories of the California Forest and Range Experiment Station.** California Forest and Range Experiment Station. 1958. pp. 46.

5444. **The status of forestry and forest research in Puerto Rico and the Virgin Islands. The eighteenth annual report of the Tropical Forest Research Center.** *Carib. For.* 19 (1/2), 1958 (1–24).

Includes acreages of soil types, forest areas etc., land and water use, losses due to defective use, research programme, research in management (including planting in 8 soil types), killing weed trees, co-operative forestry, technical assistance, etc., and a note on the growth rate of *Cecropia peltata*.

5445. **Forest Department Sarawak Research Programme 1959–63.** Forest Department, Kuching, Sarawak. [1959.] pp. 23 + 2 forms.

95. Forest Taxation

5446. FISAC BENAVENTE, M. La política fiscal española, causa da la despoblación de nuestros montes. **[Spanish fiscal policy, cause of the degradation of our forests.]** *Montes, Madrid* 15 (85), 1959 (47–50). [Span.]

Presents, on the basis of a hypothetical forest stand of 1 ha. in Galicia, an estimate of the taxes payable on fully stocked forest and on degraded or clear-felled forest land, and explains the deleterious effects of a system by which taxation is saved by keeping the land deforested. It is suggested that the present procedure should be reversed, and afforestation aided by the state from taxes levied on unproductive forest land.

96. Forest Labour Questions; Labour Questions in Wood Transport and the Wood Industries

5447. **Tripartite technical meeting on the timber industry. Note on the proceedings of the meeting (Geneva, 8–19 December 1958).** International Labour Organization, Geneva, No. *TMT*/1958/14, 1958. pp. 70.

Includes reports, discussions, resolutions etc. of the subcommittee on accident prevention and conditions of work and workers' welfare in logging camps, and that on labour-management relations in the timber industry.

5448. **Tripartite technical meeting on the timber industry. Reports. I. Background report. II. Accident prevention in the timber industry. III. Conditions of work and workers' welfare in logging camps. IV. Labour-management relations in the timber industry.** International Labour Organization, Geneva. 1958. pp. 125; pp. 109; pp. 130; pp. 105. Many refs.

Reports prepared by I.L.O. for the main items of the agenda of the meeting on labour in the timber industry, held at Geneva in Dec. 1958, on the basis of information received from ca. 24 countries and general documentation. Timber industry is here defined as the harvesting, transport and primary conversion of wood. (I) includes a general survey of the industry and manpower problems (labour force, employment and unemployment, absenteeism, forest villages, training etc.); (II) covers causes and types of accidents, promotion of greater safety and international co-operation for prevention of accidents; (III) covers living conditions in logging camps, conditions of work, wages and earnings, insurance, pensions etc.; (IV) deals with workers unions, farmers' associations etc., collective bargaining etc., consultation and co-operating, disputes and their settlement.

5449. STOECKELER, J. H., TRENK, F. B., and STROTHMAN, R. O. **Timber growth and labour opportunities for sustained harvest cuts Argonne Timber Harvest Forest.** *For. Res. Note Wis. Coll. Agric.* No. 46, 1959. pp. 2.

An 8-year study in a 40-acre block of farm forest, indicating yields of sawlogs, pulpwood and fuelwood for each year, equipment used, and labour requirements.

5450. STOECKELER, J. H., TRENK, F. B., and STRATHMAN, R. O. **Wage income from improvement harvest cuts—Argonne Timber Harvest Forest.** *For. Res. Note Wis. Coll. Agric.* No. 47, 1959. pp. 2.

A study of wages earned on a 40-acre block of farm forest over an 8-year period.

97. International Forest Policy and Other International Collaboration

971. Congresses, Conferences

See also Nos. 4306, 4354, 5208, 5338, 5447–8.

5451. **Papers, International Union of Forest Research Orgnizations, 12th Congress, Oxford 1956. Vol. I.** Forestry Commission, London. 1958. pp. 469. [E.F.G.]

Papers read in Sections 11 (General Forest Influences), 21 (Research on Site Factors), and 22 (Study of Forest Plants), and for the most part noticed separately in *F.A.* 18. [Cf. *F.A.* 20 No. 1339.]

5452. **Documents and minutes of the meetings of the Forestry Division, 9th Pacific Science Congress, Bangkok, Nov. 18–30, 1957.** [No publisher given.] [*n.d.*] Documents paginated separately.

The contents include national reports on forestry research in Australia, N. Borneo, Japan, Malaya, Sarawak, and Thailand, and a number of original papers (with discussions): Mangrove forest in Thailand (*D. Banijbatana*; pp. 10 + 24 photos); Reforestation of *Imperata* and other waste lands in Thailand (*P. Hambanada*; pp. 13); Natural regeneration of logged tropical rain forest (*D. I. Nicholson*; pp. 7, 7 refs.); Linear regeneration sampling in the Federation of Malaya (*Abdul Majid* and *J. Wyatt-Smith*; pp. 3 and 2 tbls.); Natural regeneration of tropical monsoon forest: the Philippine dipterocarp forest (*M. R. Reyes*; pp. 15; 10 refs.); Reforestation of *Imperata* waste lands in the Philippines (*P. San Buenaventura*; pp. 8 + 1 map, 15 photos).

FORESTRY THE WORLD OVER

References: 1. *Allgemeine Forstzeitschrift*, Munich; 2. *Asia-Pacific Forestry Commission Newsletter*, Bangkok; 3. *Bois et Scieries*, Paris; 4. *British Columbia Lumberman*, Vancouver; 5. *Connecticut Woodlands*, Wallingford, Conn.; 6. *Forestry Newsletter for the Near East*, Cairo; 7. *Girios Aidas*, Chicago; 8. *Holz-Kurier*, Vienna; 9. *Holz-Zentralblatt*, Stuttgart; 10. *India News*, London; 11. *Journal of Forestry*, Washington; 12. *Lesnaja Promyšlennost'*, Moscow; 13. *Lumberman*, San Francisco; 14. *New Commonwealth*, London; 15. *New Zealand Forestry Service Newsletter*, Wellington; 16. *Paper Trade Review*, London; 17. *Priroda*, Moscow; 18. *Revue Forestière Française*, Paris; 19. *Timber and Plywood*, London; 20. *Timber Trades Journal*, London; 21. *Timberman*, Portland, Ore.; 22. *Unasylva*, Rome; 23. *Wood*, London; 24. *Wood-Worker*, Indianapolis; 25. *Wood Working Digest*, Wheaton, Ill.

International. The working party on Mediterranean forest defoliators of the Commission Internationale de Lutte Biologique held its second session at Lisbon in June 1959. It was decided to set up a sub-group on *Lymantria dispar* in addition to the sub-group on *Thaumetopoeap ityocampa* already in existence (**18**; July 1959).

Australia. The new Sydney Myer 'music bowl' at Melbourne, an open-air concert hall with seating for 2000, consists essentially of a canopy of waterproof ½-in. Australian plywood faced on both sides with aluminium and supported on 70-ft. steel and fibreglass masts. The structure is designed for flexibility in high winds and is said to provide adequate acoustic conditions (**19**; 20.8.1959).

Austria. The sawing research institute of the Austrian sawmillers in Kuchl, Salzburg, offers to test any member's frame saw with an electronic device capable of showing or registering working faults such as slipping rollers, bad synchronization of feed and saw, cutting upwards, etc., while the saw is working at normal speed (**8**; 17.9.1959).

Canada. A co-operative research project on the long-distance hydraulic carriage of wood chips is being undertaken by several companies in N. America, since the cost of further developing the system of pneumatic transport, already in use for distances ≯ 1 mile, appears to be prohibitive. Three parallel circuits of 8-in. pipelines, of steel, aluminium and plastic respectively, and each 176 yd. long, are to be built, and it is planned to pump large quantities of commercial chips through the circuits for hundreds of miles. If pulping tests on samples taken at various distances prove satisfactory, practical development of the system could lead to the replacement of present pulpwood harvesting methods by chipping *in situ* in the forest, followed by direct transport to the mill. Although certain technical problems, such as bark removal, must first be solved, considerable savings in log handling and the avoidance of loss through sinkage of hardwoods from remote sites are envisaged (**16**; 13.8.59).

Research by the Vancouver Forest Products Laboratory into the chemical composition of Western Red Cedar revealed that the wood contained an easily extracted fraction of water-soluble pyrocatechol derivatives. Tests have now been made of the usefulness of this extractive in the electrolytic refining of metals, and a U.S. Patent (No. 2,877,165) has recently been granted to the Consolidated Mining & Smelting Co. of Canada for the use of the extractive in the electrolytic refining of lead (**4**; July 1959).

Colombia. A new law passed by the Colombian Government establishes an extensive national forest system and provides also for national parks. The area involved is nearly 50% of the total area of the country. The administration of the public forest and watershed protection areas, including privately owned lands within these units, is placed under the supervision of the Minister of Agriculture (**11**; July 1959).

France. After two years of experiment, the firm of Gustin Fils has developed a portable chipper with a number of original features, specially designed for the conversion of smallwood in the forest. With a cutting angle of 45°, horizontal feed, and a log carriage specially designed to deal with irregularly shaped logs, it combines a conveyor system by which the chips are conveyed directly into trucks, ready for transport to the pulp mill without any intermediate handling. It is also suitable for chipping sawmill waste (**3**; 4.6.1959).

Germany. When sections of telegraph poles were subjected to oscillations similar to those set up by the swaying of poles in the wind, their strength was markedly reduced compared with that of controls. The broken ends exhibited a short-fibred appearance similar to that usually attributed to soft rot, and quite different from the usual long-fibred breaking pattern of controls. These results were obtained alike on untreated, oil-, or salt-treated poles (**9**; 27.8.1959).

Experiments at the Landmaschineninstitut, Göttingen, indicate that under certain conditions it may be possible to protect plants against frost by spraying them with water mixed with compressed air (**1**; 19.9.1959).

Great Britain. The "Corrply" beam, recently introduced by the Rainham Timber Engineering Co. Ltd., consists of 2 main timber flanges and an undulating centre-plywood web glued into snake slots running the full length of each flange member. There are no nails, bolts or dowels, and the shape of the corrugated central plywood member reduces the risk of cracking. Primary cracking of the joints is virtually impossible since any shearing stresses in the glue joints are carried continuously along the flange. Obtainable in any length, the beam is said to provide greater strength than a trussed girder of equal depth, and to offer 50% saving in timber compared with solid beams of similar load capacity (**20**; 24.10.59).

A timber roof of hyperbolic paraboloid design has been chosen in the construction of a new indoor bowling green at Cardiff. Designed to cover an area 135 ft. square, the roof comprises 4 sections ca. 70 ft. square, with a rise of 16 ft. from the lower to the higher levels. Beams incorporated in the structure are made up of 12 laminations of 1 × 10 in. Douglas Fir and are 70 ft. long (**19**; 3.9.1959).

Special 11 × 3 ft. Weyroc chipboards have been used to roof a new church at South Merstham, Surrey. Designed to fit across the concrete arches set at 11 ft. centres, the board joints are situated at each arch and are thus invisible from inside the church. A saving of some 30% in roof-fixing costs over matchboarding has been effected (**23**; Aug. 1959).

India. The Uttar Pradesh allocation for forest development during the third Plan period has been raised to Rs. 700 million compared with Rs. 100 million and Rs. 220 million for the 1st and 2nd Plans respectively. The Plan will include 17 schemes for development and preservation of forests as well as farm forestry (**10**; 24.10.1959).

Lithuania. Since 1944 the Lithuanian Forest Academy has turned out about 50 graduates per year, and bigger classes are now being organized. In 1957, foresters' schools (*technikumus*) at Vilna turned out 367 foresters (July 1958).

New Zealand. The N.Z. Forest Service is introducing a tree seed certification scheme coupled with tree breeding and provenance trials designed to improve crops. The scheme has a high priority in the research projects of the Forest Research Institute (**2**; Summer 1959).

In the Marra process for laminating timber, the individual laminates are assembled in the press with no glue, but are separated by electrical strip heating elements. After the current has been passed for a sufficient time to heat the surfaces of the pieces, the heaters are removed and replaced by thin films of solid phenolic resin glue. When pressure is applied, the stored heat cures the glue (**15**; July 1959).

Rhodesia. The lake behind the Kariba Dam will eventually cover ca. 5000 sq. km. of what was previously forest and bush country. In order that this vast new lake may supply fish as well as hydro-electric power, large areas (15,000 to 25,000 ha.) in the Zambezi valley now being flooded are cleared of brush and trees and then levelled to constitute fishery beds. The larger trees are axe-felled, including numbers of giant Baobab (*Adansonia digitata*) trees, many of them 15 m. in diameter. The smaller trees are pushed over by means of tractors and chains. The trees in areas between the fishery beds are not being felled, but channels are being driven through them, lined with marker buoys. Through these cleared channels the fishing fleets will eventually be able to sail from one fishery bed to another (**22**; Summer 1959).

Spain. Of 22 lifeboats on a Spanish emigrant liner, only one was found to be in a 'fit and ready' state when the ship docked at Fremantle, Australia. The sound boat was of wood, the remainder all of steel. They were said to be in a dangerous condition, with some of the plates so corrroded that a hole could be made by finger pressure alone. Had the lifeboats been required during the voyage there would have been a major disaster. The ship's master was fined £A500 and the voyage was terminated (**23**; July 1959).

Syria. The text has been released of a Presidential Order on the distribution of uncultivated land among inhabitants of the forest areas of the Northern Region. Every family will receive 3 ha. of uncultivated state land in order to plant it with trees, on condition that the beneficiaries actually live on the granted land. The Ministry of Agriculture will provide free planting stock as well as the necessary technical advice (**6**; 15.8.1959).

Tanganyika. Tanganyika's first large Wattle extract factory has been opened at Njombe in the Southern Highlands Province, and is expected to produce some 30 tons of extract daily, with an annual export value of £450,000. Hitherto the Wattle industry has been confined to bark, with exports valued at ca. £70,000 annually (**14**; April 1959).

At present whole cashew nuts are exported to India, where they are roasted (with consequent loss of oil) and cracked with a hammer by hand, which frequently breaks the kernel. Mr. F. Lawton of Amapata Minerals has now invented a simple mechanical means (provisionally patented) of opening the nuts. An African has already been trained to open 10 nuts per minute with this device without breaking the kernel, and it is thought that 1000/hour will be possible with practice. It is hoped that by this means the cashew nut crop can be exploited in East Africa. Each machine costs about £10 without the motor (**14**; 1959).

U.S.A. In an attempt to increase seed production, a test area of 15 acres of young Douglas Fir in Oregon has been treated from the air with DuPont Nu-green fertilizer. The area was first cleared of stumps, undergrowth, etc., thinned to different specifications, and one plot also pruned. Applications were made at rates of 200, 400, and 600 lb./acre, total costs (including both flying and fertilizer) being respectively $26.50, $53.00 and $79.50 (**21**; July 1959).

During the past decade, millions of seedlings of Multiflora Rose have been planted for hedges and for wildlife cover. Landowners have been assured that the space requirements for a living fence would be 6–10 ft. and that plants could be easily confined to any desired area. This appears to be true when adjoining land is under a crop rotation and lateral spread is controlled by ploughing and mowing. But Multiflora Rose is a very prolific producer of seed, and the seed, being attractive to wild birds, is scattered in and along the edges of woodlands where they roost or seek shelter. A report has been received recently from a landowner who planted a fence ca. 10 years ago and now finds his woods so grown up with volunteer Rose plants that he is faced with a $300 spraying job to eradicate it (**5**; Oct. 1959).

The Central States Experiment Station has collected information which indicates that mulching can be detrimental to the survival of young trees under certain conditions. It was found that 70% of unmulched young trees in an Iowa test plot survived the first year after planting, while only 40% of the mulched trees survived. The difference was caused by heavier rabbit damage to mulched trees (**5**; Oct. 1959).

A new forest fire research laboratory near Macon, Georgia, is a joint undertaking between the U.S. Forest Service and the State of Georgia. The work will include special studies in convection, heat transfer, and fire physics (**22**; Summer 1959).

DayGlo, a semi-luminescent paint used on aircraft for more rapid identification, is being used on the safety helmets worn by loggers, and is said to have materially reduced accident rates. Many accidents are due to the difficulty of seeing where a man is working, but with this new paint on his helmet a man can be detected even through thick undergrowth (**21**; July 1959).

Logs that sank to the bottom of a millpond at Valsetz, Ore., 40–50 years ago, are being recovered by divers at a rate of 10,000 bd. ft. daily. The divers work from a large raft with a square hole in the centre to provide openings for a winch with tackle and tongs. Divers carry the tackle and tongs to the bottom of the pond, fasten them to a log, and signal the winch operator to raise it (**13**; Aug. 1959).

The Chamber of Commerce of Hoquiam, Wash., has recently opened a tourist information centre located in and carved from a single 14-ton log of Spruce and called 'One-Log House'. The door, two windows and interior chamber were carved out by a chain-saw operator, removing ca. 460 cu. ft. of wood from the giant log, which measures 38 ft. in girth (**20**; June 1959).

One of the main tourist attractions at the recently renovated Boston State House is a 250-year-old sundial whose 6 ft. 6 in. × 9 ft. 3 in. face has been restored with exterior-type, medium-density Fir plywood having a smooth resin-fibre overlay that takes paint well. It is painted a deep cobalt blue, with black numerals on a white border, diagonal guide lines in gold leaf, and the gnomon of bronze (**23**; Sept. 1959).

Cascade Treating Co., Olympia, Wash., has developed an incising machine to handle its output of poles and piling. During a test period of 6 months it increased output by 25% by eliminating many of the formerly badly split poles. During incising, 150 lb. of compressed air is used to force small steel knives $\frac{3}{4}$-in. into the pole every $2\frac{1}{2}$ in. along its length (**13**; Aug. 1959).

A new particle board now under investigation at the Oregon Forest Products Research Center is made from Douglas-Fir bark without addition of the usual binding and sizing materials. The process takes advantage of natural resin and wax components inherent in Douglas Fir bark (**13**; July 1959).

Pacqua Inc. of Dillard, Ore., is adding ingredients to its particle board to make it waterproof (by using phenolic glue) or insect-repellent and fungus-resistant (by adding chemicals during the manufacturing process). In each case the chemical penetrates the whole thickness of the board, so that subsequent cutting does not expose unpreserved edges (**13**; July 1959).

The Rockwell Manufacturing Co. of Pittsburgh, Pa., has introduced a plywood-cutting saw blade which is said to eliminate chipping, shattering or splintering. The small diameter (7 in.) of the 200-tooth blade increases the cutting speed, and the numerous small teeth, striking the wood in rapid succession, cut veneer fibres. It is said to be particularly advantageous in cutting thin veneers (**24**; Sept. 1959).

The U.S.D.A. has announced plans, in accordance with the regulations for setting up areas of great public interest, to establish a special Earthquake Geologic Area in national forest lands in Montana affected by the violent earthquakes of 17 and 18 Aug. 1959. The area will be managed to protect and preserve evidence of earthquake action, providing an exceptional opportunity for study. It is another instance of the U.S.D.A., through the Forest Service, managing the national forests for the public interest (**11**; Oct. 1959).

U.S.S.R. The story of an African man-eating tree, the Luatomwayo, recently published in several Russian newspapers, has caused a good deal of interest in the Soviet Union. The story tells how an officer out hunting endeavoured to save his dog who was caught and killed by the tree. He himself was fettered by the Luatomwayo's 'black proboscides' and was rescued in the nick of time by his troop of soldiers. When, with great difficulty, they burned the tree, the air all around was foul with the stench of burning meat. However, Soviet scientists have dismissed the story of the Cannibal Tree as the "wildest fantasy" (**12**; July 1959).

Two interesting cases of phototaxis in *Fagus sylvatica* were observed in the 40-year-old Adžhikend Forest in the Azerbaijan S.S.R. One tree, having assumed an arch shape as a sapling, could not grow upwards after removal of the neighbouring canopy, and, growing back into the ground, put up 2 boles of 18 and 28 cm. d.b.h. to heights of 17 and 20 m. The second formed an S-shape to a height of 3·5 m. before growing normally to 15 m.; two younger straight trees supported the deformed Beech by growing up through its lower curve, natural grafting of the inner tree to the main bole occurring at a height of 1 m. (**17**; May 1959).

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Rudolf Dimpflmeyer

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Forstwissenschaftliche Forschungen No. 12, 1959. Pp. 75. 16 figures. Board *DM* 16.50. For subscribers of Forstwiss. Cbl. *DM* 13.20

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